Taiwanese Journal of Obstetrics & Gynecology 55 (2016) 568–574

Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Original Article

Nuchal cord complication in male small for gestational age increases fetal distress risk during labor

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ARTICLE INFO

Article history:
Accepted 31 March 2016

Keywords:
cesarean delivery
fetal distress risk
nuchal cord
small for gestational age

ABSTRACT

Objective: This study aimed to evaluate whether a nuchal cord increases the risk of perinatal complications during labor, and whether fetal growth and sex affect the risk of fetal distress.

Materials and Methods: Medical records of 1749 women with singleton pregnancies planning a vaginal delivery were enrolled. Patients were divided into two groups according to the presence or absence of a nuchal cord at birth. Multivariate logistic regression analyses, odds ratios (ORs), and 95% confidence intervals (CIs) were used to determine whether the risks of perinatal complications increased in the nuchal cord group.

Results: A nuchal cord is associated with higher risks of Rupture of membranes (ROM) prior to delivery (OR = 1.40, 95% CI: 1.12–1.76, $p = 0.0031$), need for augmentation during labor (OR = 1.68, 95% CI: 1.27–2.23, $p = 0.0003$), prolonged second stage of labor (OR = 2.54, 95% CI: 1.55–4.25, $p = 0.0002$), non-reassuring fetal heart risk during labor (OR = 2.89, 95% CI: 2.18–3.84, $p < 0.0001$), and instrumental delivery or cesarean delivery (OR = 2.00, 95% CI: 1.55–2.58, $p < 0.0001$). Fetal distress risk during labor was affected by fetal growth and sex, with male small for gestational age fetuses with a nuchal cord having a significantly higher risk than the control group (OR = 9.77, 95% CI: 3.67–25.79, $p < 0.0001$), despite there being no significant differences in the neonatal Apgar scores at 1 minute or 5 minutes, or in the need for neonatology between the two groups.

Conclusion: Nuchal cord is associated with perinatal outcomes. Male small for gestational age fetuses with a nuchal cord have a significantly higher risk of fetal distress during labor. Our results suggest that evaluation of fetal sex and body weight is also important in antenatal ultrasonography if a nuchal cord is found.

Introduction

Nuchal cord is commonly found by ultrasonography before delivery or at delivery. The prevalence of nuchal cord at delivery, reported as 28.2–33.7% [1,2], apparently increases in prolonged gestations [3]. A study based on 166,318 deliveries demonstrated that nuchal cord is associated with nonreassuring fetal heart rate (FHR) during labor [4]. However, a higher rate of cesarean delivery was not observed in nuchal cord groups [4–6]. Several studies also claimed that routine antenatal ultrasonography is not essential because nuchal cord is not associated with adverse neonatal outcomes [1,2,6,7]. Conversely, studies have demonstrated that umbilical cord complications are found in most stillbirths [8,9]. Nkwabong and Fomulu [10] reported a perinatal death rate of 6.1% in 198 cases of nuchal cord in a hospital in Cameroon, where clinicians were not always aware of the presence of nuchal cord because ultrasonography was sometimes unavailable. A study examining cerebral palsy in infants reported that a tight nuchal cord is a risk factor for spastic cerebral palsy and spastic quadriplegia [11]. Although many studies have reported that a higher risk of nonreassuring FHR is found in fetuses with a nuchal cord, there is no consensus regarding perinatal risk management owing to different neonatal outcomes reported in the literature [12].

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http://dx.doi.org/10.1016/j.tjog.2016.03.002

Including nuchal cord as a risk factor for adverse perinatal outcomes without careful consideration might increase cesarean rates on patient's request due to maternal anxiety [13]. By contrast, if antenatal ultrasonography and counseling are not considered to be essential, then it should be questioned whether this applies to all patients with a nuchal cord.

However, small for gestational age (SGA), defined as birth weight below the 10th percentile for gestational age clinically, is a risk factor for cerebral palsy [14] and stillbirth [9,15,16], although it is theoretically easier for a smaller fetus to pass through the birth canal during labor. In addition, recent studies have indicated that male fetuses have a higher risk of birth asphyxia [17] and stillbirth [18]. Therefore, we asked the question whether the risk of complications due to nuchal cord is affected by fetal growth and sex during labor. If a significant influence is found in cases of nuchal cord complicated with SGA or male fetuses, we consider that perinatal management should be different and much more careful. This study aimed to evaluate whether a nuchal cord increases the risk of perinatal complications during labor and whether fetal growth and sex affect the risk of fetal distress.

Materials and methods

This study received institutional review board approval from the ethics committee of Warabi City Hospital (Saitama, Japan). The need for informed consent was waived because the study involved a retrospective review of medical records. Patient records/information was anonymized and deidentified prior to analysis. In our hospital, all delivery records are carefully reviewed and stored in a database by an obstetrician with >20 years of experience in delivering babies. For this study, medical records between 2008 and 2011were extracted from the database and carefully reviewed. There were 2147 deliveries during this study period. We excluded 96 births that were multiple pregnancies or terminations at <22 weeks or stillbirths at <37 weeks of gestation, 223 births that were planned cesarean deliveries owing to previous cesarean delivery or breech presentation, and 79 preterm deliveries that may have increased the need for care by a neonatologist. Finally, 1749 women with singleton pregnancies planning a vaginal delivery were enrolled in this study. The patients were divided into two groups according to the presence or absence of a nuchal cord at birth. In this study, a nuchal cord is defined as the presence of a loop of umbilical cord that passes 360° around the fetal neck, found at delivery. Multiple nuchal cords (two or more turns) are defined as ≥720° around the fetal neck.

During this study period, the nuchal cord was not routinely evaluated in antenatal ultrasonography. Furthermore, no special management was planned if a nuchal cord was diagnosed before delivery. In our hospital, no patient underwent epidural analgesia for pain relief or cesarean delivery that was not medically necessary. In our evaluations, we included maternal age, parity, body weight before pregnancy, increase in body weight during pregnancy, gestational age, complications including rupture of membranes before delivery, need for augmentation during labor, arrested labor, prolonged second stage of labor, nonreassuring FHR during labor, severe meconium in the amniotic fluid, instrumental delivery, and emergency cesarean delivery. Regarding neonatal outcomes, fetal sex, body weight, SGA, Apgar score at 1 minute and 5 minutes after birth, and need for care by a neonatologist were included. A prolonged second stage of labor was defined as lasting >2 hours in nulliparous and >1 hour in multiparous women.

In this study, fetal growth was evaluated by birth weight for gestational age; SGA was defined as birth weight below the 10th percentile for gestational age. Large for gestational age (LGA) was defined as birth weight above the 90th percentile for gestational age; average gestational age (AGA) was defined as birth weight between the 10th and 90th percentile for gestational age, based on the centile charts for sex-specific birth weight for gestational age for Japanese singleton births published by the Japan Pediatric Society in 2010.

Wilcoxon's test was used for comparisons between the groups, and $p < 0.05$ was regarded as statistically significant. Multivariate logistic regression analyses and odds ratios (ORs) and 95% confidence intervals (CIs) were used to compare risks. All measurements were stored and analyzed using JMP version 10.0 (SAS Institute).

Results

Among the 1749 deliveries, there were 1052 births with no nuchal cord and 697 with a nuchal cord (Figure 1). Table 1 shows the comparisons of patient characteristics between the two groups. Of 1749 pregnancies, 409 (58.7%) were nulliparous in the nuchal cord group and 525 (49.9%) in the no nuchal cord group. There were 389 (55.8%) male fetuses in the nuchal cord group and 513 (48.8%) in the no nuchal cord group. There were slight but significant differences in maternal age, gestational age, birth weight, parity, and fetal sex between the groups (Table 1). By multivariate analyses, we found a higher risk of labor commencing after 40 weeks' gestation (adjusted OR = 1.33, 95% CI: 1.08–1.64, $p = 0.0076$); rupture of membranes before delivery (adjusted OR = 1.40, 95% CI: 1.12–1.76, $p = 0.0031$); need for augmentation during labor (adjusted OR = 1.68, 95% CI: 1.27–2.23, $p = 0.0003$); prolonged second stage of labor (adjusted OR = 2.54, 95% CI: 1.55–4.25, $p = 0.0002$); nonreassuring FHR (adjusted OR = 2.89, 95% CI: 2.18–3.84, $p < 0.0001$); instrumental delivery (adjusted OR = 1.79, 95% CI: 1.35–2.39, $p < 0.0001$); cesarean delivery (adjusted OR = 2.01, 95% CI: 1.30–3.16, $p = 0.0017$); instrumental delivery or cesarean delivery (adjusted OR = 2.00, 95% CI: 1.55–2.58, $p < 0.0001$); severe meconium in the amniotic fluid (adjusted OR = 1.57, 95% CI: 1.01–2.45, $p = 0.0436$) in the nuchal cord group compared with the no nuchal cord group (Table 2), although the risk of intrauterine infection was not significantly increased (adjusted OR = 1.44, 95%

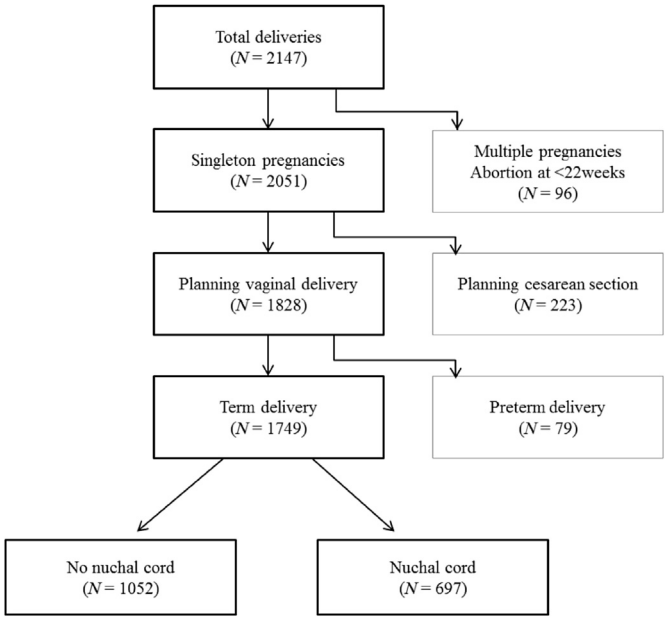

Figure 1. Flowchart of inclusion of patients in the study. The study population included 1749 term deliveries separated into two groups according to the presence or absence of a nuchal cord at birth.