Umbilical Vascular Coiling and the Perinatal Outcome

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Summary

Umbilical vascular coiling index was calculated in 130 neonates and was correlated with the perinatal outcome. Hypocoiled cords were found to be associated with a higher incidence of preterm delivery (38.8% P=0.001) and congenital anomalies (16.6% P=0.000) and both hypo and hyper coiled cords were associated with a higher incidence of low apgar score (44.4% P=0.000 and 40% P=0.013) when compared to normocoiled cords.

Introduction

The umbilical cord which is the lifeline of the foetus has three vessels coursing through it arranged in a helical fashion. This coiling property of the vessels has been noted as early as 1521 by Berengarius (as reported by Edmonds, 1954). The average number of helices is 11 and the absence of coiling has been reported to be associated with an adverse perinatal outcome (Heifetz, 1996).

Aim

The aim of the study was to correlate the perinatal outcome with the umbilical coiling index.

Materials and Methods

In a prospective study umbilical cords of 130 neonates who were born in the department of Obstetrics and Gynaecology of St. John's Medical College Hospital from May 1998 to July 1999 were evaluated. The length of the cord and the number of coils were noted. A coil was defined as a complete 360 degree spiral course of umbilical vessels. The coiling index was calculated by dividing the total number of coils in the cord by the length of the cord measured in centimeters. The study group was divided into 3 groups.

Group I comprised of hypocoiled cords with coiling index (C.I) of $\leq$ 5th percentile ($\leq$0.06), Group II consisted of normocoiled cords with C.I between 5th & 95th percentile (>0.06–<0.28). Group III was the hypercoiled group with a C.I of >95th percentile (>0.28). The variables analysed were preterm delivery (<37 weeks) presence of meconium; operative delivery; low apgar score (<7); congenital anomalies; intrauterine death; small for date babies and sex of the baby. Statistical analysis was done using Primer of Biostatistics by Stanton A Glantz copy right © 1992 by MC Graw Hill, INC.

Results

The mean umbilical coiling index was 0.14 ± 0.084 coils per centimeter. The frequency distribution curve of the coiling index is given in Fig. 1. The distribution is normal with a skew to the right.

The mean gestational age for group I was 36.6 ± 1.8 weeks for group II 38.66 ± 1.8 weeks and for group III 36.9 ± 4.9 weeks.

In the hypocoiled group when compared to the normocoiled group there was significantly higher incidence of preterm delivery 38.8% vs 8% P=0.001; low apgar score 44.4% vs 8.8% (p=0.000) and congenital anomalies 16.6% (P=0.000). The anomalies encountered were anencephaly in one baby; prosencephaly in another and inencephaly with ventral wall defect and contracture of limbs in the third one.

When compared for the presence of meconium, operative delivery, intrauterine death, preterm, small for date babies and sex of the baby there was no significant difference among the hypocoiled and the normocoiled groups.

There was a significantly higher incidence of babies with low apgar score in the hypercoiled group when compared to the normocoiled group 40% vs 8% (P=0.015). When analysed for the other variables there was no significant increase in the hypercoiled group.

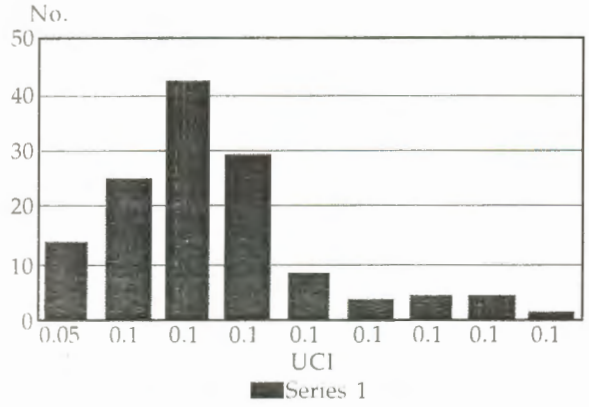

Fig. 1: Umbilical Coiling Index

Discussion

It has been observed that the helical structure of the umbilical vessels is established as early as the 8th week of gestation and the cord increases in length by increase in the length of the pitch of the primary helix (Malpas and Symond, 1966). Various hypotheses have been proposed with regard to the umbilical vascular coiling and these include foetal haemodynamic forces (Malpas and Symond 1966), foetal rotational movements (Edmonds, 1954), differential umbilical vascular growth rates (Larco et al, 1987) and genetic properties of the cord (Strong et al, 1994).

The coiling of the vessels make the umbilical cord a semierectile organ which has more resistance to compression torsion and stretch when compared to a noncoiled one. Umbilical cords which are not coiled tend to be flaccid and are more prone for prolapse after ruptue of membranes (Strong, 1997). Umbilical venous flow has been observed to be reduced in noncoiled vessels (Degani et al, 1995).

An increased incidence of foetal deaths has been reported with noncoiled cords (Lacro et al, 1987). Strong et al (1993) have reported a higher incidence of intrauterine death, preterm delivery, intrapartum foetal heart decelerations, operative deliveries, meconium staining and congenital anomalies in foetuses born with noncoiled umbilical cords. Another study has reported a higher incidence of karyotypic abnormalities, meconium staining and operative deliveries associated with hypocoiled cords and intrapartum foetal heart deceleration associated with both hypo and hypercoiled cords (Strong TH et al, 1994). Rana et al (1995) have observed a higher risk for operative delivery and intrapartum foetal heart variations with hypocoiled

Table-I

	Hypo coiled (N-18)		Normocoiled (N-102)	Hyper coiled (N=10)	
	No(%)	P. value	No.(%)	No(%)	P. value
Preterm	7 (38.8%)	P= 0.001	8 (7.8%)	2 (20%)	P= 0.477
Operative Delivery	5 (27.7%)	P= 0.053	9 (8.8%)	3 (30%)	P= 0.125
Meconium	6 (33.3%)	P= 0.063	13 (12.7%)	2 (20%)	P= 0.872
Apgar>7	8 (44.4%)	P= 0.000	9 (8.8%)	4 (40%)	P= 0.015
Congenital anomalies	3 (16.6%)	P= 0.000	0	0	
IUD	2 (11.1%)	P= 0.078	1 (.91%)	1 (10%)	P= 0.401
Sex F	9 (50%)	P= 0.859	10 (49%)	4 (40%)	P= 0.832
Term SFD	1 (9%)	P= 0.571	18 (21.4%)	1 (12.5%)	P= 0.891

cords and a risk for preterm delivery with hypercoiled cords. In this study we have observed a higher incidence of preterm delivery and congenital anomalies in the hypocoiled group and a higher incidence of low apgar in both the hypocoiled and the hypercoiled group.

In the antenatal period the coiling of the vessels can be identified by USG or by Doppler studies (Strong, 1997, Degani et al 1995). Since most of the studies have shown a suboptimal perinatal outcome in foetuses with hypocoiled and noncoiled cords an attempt may be made to identify these cords during routine ultrasonography so that the foetuses at risk can be identified in the antepartum period.

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