



UMBILICAL COILING INDEX AND ITS ASSOCIATION WITH ADVERSE PERINATAL OUTCOMES

Gynecology

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ABSTRACT

Aim: The aim of present study was to determine umbilical coiling index postnatally in our geographic region and to correlate it with adverse perinatal outcomes.

Method: This was a prospective study which was conducted in Department of Obstetrics and Gynecology at Eras Lucknow Medical College, Lucknow from September 2015 to October 2015.

One hundred and ten pregnant women irrespective of parity, with term gestation and singleton pregnancy in active labour and admitted in labour room were studied. Patients were observed in the second and third stage of labor.

Results: Out of 110 coils evaluated at birth 47 (42.72%) were of female babies and 63 (57.27%) were of male were seen in 88 (80%) cases while clockwise coiling were seen in 22 (20%) cases ($t=2.57$, $p<0.01$) TABLE 1 When we compared the normocoiled group ($n=88$) with the hypocoiled group ($n=12$), low Apgar score, PIH in mother, meconium staining, NICU admission, were significantly higher in the latter.

Conclusion: Low umbilical coiling index might be evaluated as an indicator of adverse perinatal outcome.

KEYWORDS

Umbilical coiling index, Hypocoiled, Singleton

INTRODUCTION:

Fetal wellbeing and survival is related to the normal development of umbilical cord which forms the principal connection between the fetus and placenta providing nutrients, oxygen, fluids necessary for life in utero.^(1,2) Two umbilical arteries carrying venous blood from fetus to mother and one umbilical vein carrying oxygenated blood from mother to fetus are arranged in a coiled fashion and traverse the entire length of cord supported by Wharton's jelly. An umbilical coil is defined as one complete spiral of 360 degrees of umbilical vessels around each other.^(2,3)

The spiral course of vessels in umbilical cord was first described by Berengarius in 1521. In 1954 umbilical coiling was first quantified by Edmonds^(2,4) who described "The Index Of Twist" as the total number of coils by the umbilical cord length in centimeters. He designated positive and negative scores to clockwise and anticlockwise coiling respectively. Later, Strong et al⁽⁵⁾ simplified it by eliminating these directional scores and named it "The Umbilical Coiling Index".

Hypotheses regarding the origin of umbilical cord coiling includes active or passive torsion of the embryo, fetal movements, fetal hemodynamic forces, differential umbilical vascular growth rates and the arrangements of muscular fibers in the arterial wall of umbilical cord. In recent years there has been increasing interest in the coiling property of umbilical cord and its correlation with various antepartum and intrapartum outcomes.

AIM: The aim of present study was to determine umbilical coiling index postnatally in our geographic region and to correlate it with adverse perinatal outcomes.

MATERIALS AND METHODS:

This was a prospective study which was conducted in Department of Obstetrics and Gynaecology at Eras Lucknow Medical College, Lucknow from September 2015 to October 2015.

One hundred and ten pregnant women irrespective of parity, with term gestation and singleton pregnancy in active labour and admitted in labour room were studied. Patients were observed in the second and third stage of labor.

INCLUSION CRITERIA: Healthy women with term gestation irrespective of parity.

- Singleton pregnancy
- Delivery both by vaginal and LSCS
- Presence of a three vessels umbilical cord

EXCLUSION CRITERIA:

- Twin pregnancy
- Any abnormality of placenta and cord
- Women not giving consent

METHODOLOGY:

Patients were observed in the second and third stage of labor. After separating the baby from the umbilical cord, the cord was tied and cut as close to placenta as possible.

- The umbilical cord was measured in its entirety, including the length of the placental end of the cord and the umbilical stump on the baby. The number of coils were counted from neonatal end toward the placental end without any delay.
- Depending upon the direction of course of vessels, umbilical cords were referred as clockwise and anticlockwise or straight.
- The Umbilical Coiling Index was calculated by dividing the total number of coils by the total length of the cord in centimeters.

A frequency distribution of umbilical coiling index (UCI) was done by Rana et al⁽⁶⁾ and it was followed in our study, they grouped the UCI as follows- (1)<10th percentile – Hypocoiled-A percentage of cords with coils that lie below 10%, (2)10th - 90th percentile-Normocoiled(3) >90th percentile-Hypercoiled-A percentage of cords with coils more than normal and lie above 90% of all.

The following maternal factors were recorded age, parity, blood group, gestational age, anemia, pregnancy induced hypertension, gestational diabetes mellitus, heart disease, antepartum hemorrhage, chorioamnionitis, oligohydramnios and polyhydramnios.

- Intrapartum factors noted were mode of delivery, fetal heart rate abnormalities, meconium stained liquor.
- Neonatal factors like birth weight, Apgar score, ponderal index, congenital anomaly and admission to NICU were noted.

RESULTS:

Out of 110 coils evaluated at birth 47 (42.72%) were of female babies and 63 (57.27%) were of male babies. The mean umbilical cord length was 43.9 ± 9.1 cm and the mean UCI was 0.13 ± 0.07 . Anticlockwise coiling were seen in 88 (80%) cases while clockwise coiling were seen in 22 (20%) cases ($t=2.57$, $p<0.01$) TABLE 1 When we compared the normocoiled group ($n=88$) with the hypocoiled group ($n=12$), low Apgar score, PIH in mother, meconium staining, NICU admission, were significantly higher in the latter.

TABLE 1-Umbilical coiling index and neonatal/perinatal outcome:

Outcome	Hypocoiled (n = 12)	Normocoiled (n = 88)	Hypercoiled (n = 10)	'p'
Pregnancy induced hypertension	4(33.3%)	9(10.2%)	0(0%)	0.032
Apgar<7	4(33.3%)	9(10.2%)	0(0%)	0.032
Meconium present	8(66.7%)	27(30.7%)	1(10%)	0.012
Birth weight<2500g	4(33.3%)	22(25.0%)	2(20%)	0.756
Intrauterine growth retardation	3(25.0%)	14(15.9%)	2(20%)	0.716
Gestational age <37 weeks	3(25.0%)	17(19.3%)	0(0%)	0.263
Ponderal index <2.5	4(33.3%)	38(43.2%)	2(20%)	0.323

TABLE 1).There was no statistically significant difference between the hypercoiled group and the normocoiled group in any of the parameter studied. On comparing the apgar score, 13 (11.81%) babies were with low apgar score of <7 and 97 (88.18%) babies had apgar score > (t=2.42, p<0.05)

TABLE-2 Mean umbilical coiling index and perinatal factors

Outcome	Number	Mean umbilical coiling index±SD	't' value	'p'
Gestation age <37 weeks	20	0.126±0.094	0.315	0.754
≥37 weeks	90	0.132±0.073		
Sex	47	0.128±0.055	0.284	0.777
Female	63	0.132±0.084		
Male				
Direction	88	0.142±0.09	2.571	0.011
Anticlockwise	22	0.089±0.07		
Clockwise				
Pregnancy induced hypertension	97	0.141±0.087	1.776	0.079
Absent	13	0.098±0.088		
Present				
Apgar <7	13	0.082±0.089	2.427	0.017
≥7	97	0.142±0.083		
IUGR	91	0.128±0.081	0.516	0.607
Absent	21	0.139±0.100		
Present				

DISCUSSION:

The coiling of vessels develops early in gestation and is present in about 95% of fetuses by 9 weeks of conception. The coiling property can be determined antenatally by ultrasonographic examination as early as during first trimester of pregnancy.⁽⁷⁾ Numerous theories have been proposed as possible cause of coiling such as foetal movements, differential umbilical vascular rates, active or passive torsion of embryo, arrangement of muscle fibres in umbilical arterial wall, however exact etiology stills stands debatable.⁽⁸⁾

The mean UCI in our study was 0.13 ± 0.07 as compared to 0.19 ± 0.1 by Rana et al⁽⁶⁾. There was a higher occurrence of anticlockwise coiling than clockwise coiling. This was reported by other studies as well. We also found significant difference in the mean UCI between anticlockwise and clockwise coiling. The reason for this finding remains unexplained. However, the predominance of anticlockwise twists is the result of more forceful paddling with the right arm of a fetus who has already established handedness⁽⁹⁾, or the cord twist is the result of either active or passive rotation of the fetus⁽¹¹⁾

In present study meconium staining was significantly associated with the hypocoiling group as reported by Gupta et al⁽²⁾ and Devaru et al⁽⁶⁾. Hypocoiled group also showed lower apgar >7. Hypocoiling may give way to kinking and compression which explains the association with poor apgar score and subsequent NICU admissions.

The result regarding PIH revealed a significant association with hypocoiled cords. Similar results were seen by Chitra et al⁽⁷⁾ and Gupta et al⁽²⁾. Although Larco et al⁽⁸⁾ found that PIH might be related with normocoiling cord.

CONCLUSION

Low umbilical coiling index is an indicator of adverse perinatal outcome. It is associated with low apgar score, meconium staining, admission in NICU, pregnancy induced hypertension. Thus antenatal studies of umbilical coiling index should be emphasized on to confirm the diagnosis at an early gestational age so as to improve the pregnancy outcome.

REFERENCES

- 1) Ferguson VL, Dodson RB. Bioengineering aspects of the umbilical cord. Eur J Obstet Gynecol Reprod Biol 2009; 144: 108-13.
- 2) Gupta S, Faridi MM A, Krishnan J. Umbilical Coiling Index. J Obstet Gynecol India 2006; 56(4): 315-19.
- 3) Adnan E. Umbilical coiling index as a predictor of adverse perinatal outcome. International Journal of Advanced Research (2014), Volume 2, Issue 2, 101-107
- 4) Edmonds HW. The spiral twists of the normal umbilical cord in twins and in singletons. Am J Obstet Gynecol 1954; 67:102-20.
- 5) Strong TH, Jarles DL, Vega JS et al. The umbilical coiling index. Am J Obstet Gynecol 1994; 170:29-32.
- 6) Rana J, Ebert GA, Kappy KA. Adverse perinatal outcome in patients with an abnormal umbilical coiling index. Obstet Gynecol 1995; 85:573-7.
- 7) T. Chitra, Y.S. Sushanth, S. Raghavan. Umbilical coiling index as a marker of perinatal outcome. Obstetrics and gynecology international 2012.
- 8) Lacro RV, Jones KL, Benirschke K. The umbilical cord twist: origin, direction, and relevance. Am J Obstet Gynecol 1987;157:833-8.