

ASSESSMENT OF UMBILICAL COILING INDEX AS A MARKER OF PERINATAL OUTCOME

Neelam Sharma¹, Chander Sheikher², Amatul³

Received : 10/03/2023
Received in revised form : 19/04/2023
Accepted : 01/05/2023

Keywords:

Coiling Index, Pre- Term Delivery,
Hypercoiled.

Corresponding Author:

Dr. Neelam Sharma,
Email: neelamyogesh19211@gmail.com

DOI: 10.47009/jamp.2023.5.3.84

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (3); 388-391



¹Antenatal Medical Officer Cum Lecturer/Assistant Professor, Department of Obstetrics And Gynaecology, GMC and AH Rajouri, Jammu & Kashmir, India.

²Associate Professor, Department of Obstetrics and Gynaecology, GMC and AH Rajouri, Jammu & Kashmir, India.

³PG, Department of Obstetrics and Gynaecology, GMC and AH Rajouri, Jammu & Kashmir, India.

Abstract

Background: To assess umbilical coiling index as a marker of perinatal outcome. **Materials and Methods:** One hundred ten pregnant women with ≥ 28 weeks of gestation having singleton live baby irrespective of parity and the mode of delivery were included in study. The number of coils of the entire cord was counted as umbilical coiling index- Total number of complete vascular coiling/total length of cord (cm). Patients were divided into normocoiled, hypocoiled and hypercoiled. Maternal factors and neonatal factors were noted. **Result:** There were 70 normocoiled, 22 hypocoiled and 18 hypercoiled cases. The difference was significant ($P < 0.05$). Pre- term delivery was seen in 7 normocoiled, 4 hypocoiled and 10 hypercoiled cases. Amniotic fluid index (< 6) was seen in 12 normocoiled, 5 hypocoiled and 2 hypercoiled cases. PIH was seen in 10 normocoiled, 8 hypocoiled and 9 hypercoiled cases, meconium staining was seen in 26 normocoiled, 16 hypocoiled and 2 hypercoiled cases, low birth weight was seen in 25 normocoiled, 11 hypocoiled and 15 hypercoiled cases, antepartum and intrapartum fetal distress was seen in 21 normocoiled, 12 hypocoiled and 5 hypercoiled cases. The difference was significant ($P < 0.05$). There were 8 normocoiled cases with APGAR score < 6 and 62 cases with > 6 . There were 14 normocoiled cases with APGAR score < 6 and 8 cases with > 6 . There were 13 normocoiled cases with APGAR score < 6 and 5 cases with > 6 . The difference was significant ($P < 0.05$). **Conclusion:** Abnormal coiling index is associated with adverse perinatal outcomes. Antenatal study of UCI should be further pursued to confirm diagnosis at an earlier gestational age.

INTRODUCTION

The umbilical cord or the “funis” is vital to the development, well-being and survival of the foetus. It is a trivascular conduit which allows the foetal blood to flow in to and from the placenta.^[1] A coil is defined as complete 360- degrees spiral courses of umbilical vessels around the Wharton’s jelly. About 95% of the umbilical cords have coils and the origin of the coiling is unknown. Edmonds HW et al. quantified the umbilical coiling by dividing the total number of coils with umbilical cord length and called it as “The Index of Twist”.^[2]

The vessels of the cord are wound as cylindrical helices, rather than spirals, but both terms are used interchangeably to avoid confusion.^[3] The coiling of the umbilical vessels develops as early as 28 days after conception and is present in about 95% of fetuses by 9 weeks of conception. The helices may

be seen by ultrasonographic examination as early as during the first trimester of pregnancy.^[4]

The number of twists seen in first trimester is roughly the same as that seen in term cords. The total number of coils seen is between 0 and 40.^[5] Umbilical coiling appears to confer turgor to the umbilical unit, producing a cord that is strong, yet flexible. Since lengthening of the cord occurs from the fetal end, perhaps coiling of the cord represents a long-term record of fetal well-being.^[6] We performed this study to assess umbilical coiling index as a marker of perinatal outcome.

MATERIALS AND METHODS

After considering the utility of the study and obtaining approval from ethical review committee, we selected one hundred ten pregnant women. Patients’ consent was obtained before starting the study. Pregnant ladies of ≥ 28 weeks of gestation

having singleton live baby irrespective of parity and the mode of delivery were included in study. The pregnant women with multi foetal gestation and having history of congenital malformed babies were excluded.

Data such as name, age etc. was recorded. Immediately after delivery, the umbilical cord was clamped at the fetal end and cut with scissors taking care not to milk the cord. The placenta was allowed to separate spontaneously. At the fetal end, the cord was cut 5 cm from the fetal insertion. The rest of the cord from the cut end to the placental insertion was measured. Five cms was added to the length of the measured cord. A coil was taken as one complete 360-degree spiral course of the umbilical vessels. The number of coils of the entire cord was counted as umbilical coiling index- Total number of complete vascular coiling/total length of cord (cm). Accordingly patients were divided into normocoiled, hypocoiled and hypercoiled.

Maternal factors such as parity, anemia, pregnancy induced hypertension (PIH), blood group, heart disease, infertility etc. were recorded. Intrapartum factors like mode of delivery, fetal heart rate (FHR) abnormalities, meconium stained liquor (MSL), and postpartum hemorrhage (PPH) were noted. Neonatal factors like APGAR, birth weight, admission to neonatal intensive care unit (NICU), and congenital anomaly were also noted. Any significant postpartum events like postpartum hemorrhage (PPH), genital tract injuries, inversion, or postpartum collapse were noted. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

RESULTS

There were 70 normocoiled, 22 hypocoiled and 18 hypercoiled cases. The difference was significant ($P < 0.05$).

Table 1: Umbilical coiling index

Umbilical coiling index	Number	P value
Normocoiled	70	0.01
Hypocoiled	22	
Hypercoiled	18	

Table 2: Assessment of umbilical coiling index and perinatal outcomes

Perinatal factors	Normocoiled	Hypocoiled	Hypercoiled	P value
Pre term delivery	7	4	10	0.04
Amniotic fluid index (<6)	12	5	2	0.05
PIH	10	8	9	0.16
Meconium staining	26	16	2	0.09
LBW	25	11	15	0.70
Antepartum and intrapartum fetal distress	21	12	5	0.82

Pre- term delivery was seen in 7 normocoiled, 4 hypocoiled and 10 hypercoiled cases. Amniotic fluid index (<6) was seen in 12 normocoiled, 5 hypocoiled and 2 hypercoiled cases. PIH was seen in 10 normocoiled, 8 hypocoiled and 9 hypercoiled cases, meconium staining was seen in 26 normocoiled, 16 hypocoiled and 2 hypercoiled cases, low birth weight was seen in 25 normocoiled, 11 hypocoiled and 15 hypercoiled cases, antepartum and intrapartum fetal distress was seen in 21 normocoiled, 12 hypocoiled and 5 hypercoiled cases. The difference was significant ($P < 0.05$) [Table 2].

Table 3: Relationship between umbilical coiling index and Apgar score at 5 mins

APGAR score at 5 min	Normocoiled	Hypocoiled	Hypercoiled	P value
<6	8	14	13	0.05
>6	62	8	5	0.01

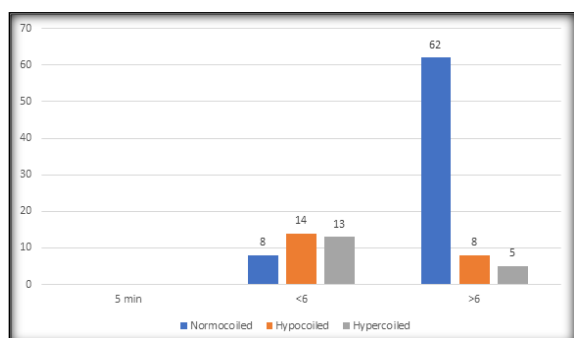


Figure 1: Relationship between umbilical coiling index and Apgar score at 5 mins

There were 8 normocoiled cases with APGAR score <6 and 62 cases with >6. There were 14 normocoiled cases with APGAR score <6 and 8 cases with >6. There were 13 normocoiled cases with APGAR score <6 and 5 cases with >6. The difference was significant ($P < 0.05$) [Table 3, Figure 1].

DISCUSSION

Umbilical cord is vital to the development, well-being, and survival of the fetus, yet this is vulnerable to kinking, compressions, traction, and torsion which may affect the perinatal outcome.^[7,8]

The umbilical cord is protected by Wharton's jelly, amniotic fluid, helical patterns, and coiling of vessels. The origin of umbilical cord coiling is unknown.^[9] Hypotheses include fetal movements, active or passive torsion of the embryo, differential umbilical vascular growth rates, fetal hemodynamic forces, and the arrangements of muscular fibers in the umbilical arterial wall. Of the many characteristics of the human umbilical cord, a most mysterious and intriguing one is the twisted or spiral course of its component blood vessels.^[10] We performed this study to assess umbilical coiling index as a marker of perinatal outcome.

Our results showed that There were 70 normocoiled, 22 hypocoiled and 18 hypercoiled cases. Tripathy assessed any adverse perinatal outcomes associated with abnormal coiling of umbilical cord.^[11] One hundred two (102) umbilical cords of babies delivered either by vaginally or by lower segment caesarean section were examined. The umbilical coiling index was calculated by dividing the total number of coils by the length of the cord. Subjects with umbilical coiling index below 10th percentile, between 10th and 90th percentile and above 90th percentile were defined as hypocoiled, normocoiled and hypercoiled respectively. Various outcome measures like gestational age at birth, intrauterine growth retardation, birth weight, meconium staining, APGAR scores at 1 and 5 mins were observed.

Pre- term delivery was seen in 7 normocoiled, 4 hypocoiled and 10 hypercoiled cases. Amniotic fluid index (<6) was seen in 12 normocoiled, 5 hypocoiled and 2 hypercoiled cases. PIH was seen in 10 normocoiled, 8 hypocoiled and 9 hypercoiled cases, meconium staining was seen in 26 normocoiled, 16 hypocoiled and 2 hypercoiled cases, low birth weight was seen in 25 normocoiled, 11 hypocoiled and 15 hypercoiled cases, antepartum and intrapartum fetal distress was seen in 21 normocoiled, 12 hypocoiled and 5 hypercoiled cases. Chitra et al,^[12] measure umbilical coiling index (UCI) postnatally and to study the association of normocoiling, hypocoiling and hypercoiling to maternal and perinatal outcome. One thousand antenatal women who went into labour were studied and umbilical coiling index calculated at the time of delivery. UCI was determined by dividing the total number of coils by the total umbilical cord length in centimeters. Its association with various maternal and perinatal risk factors were noted. The mean umbilical coiling index was found to be 0.24 ± 0.09 . Hypocoiling (<0.12) was found to be significantly associated with hypertensive disorders, abruptio placentae, preterm labour, oligohydramnios, and fetal heart rate abnormalities. Hypercoiling (>0.36) was found to be associated with diabetes mellitus, polyhydramnios, caesarean delivery, congenital anomalies, and respiratory distress of the newborn. There were 8 normocoiled cases with APGAR score <6 and 62 cases with >6. There were 14 normocoiled cases with APGAR score <6 and 8

cases with >6. There were 13 normocoiled cases with APGAR score <6 and 5 cases with >6. Gupta S et al,^[13] studied and observed that incidence of operative delivery, preterm delivery, growth retardation; meconium staining was significantly higher in hypocoiled group than those with normal coiling group. Devaru D et al,^[14] found that there was a high incidence of meconium staining in hypocoiled group. Kashanian et al,^[15] found oligohydramnios to be significantly associated with both hypocoiled and hypercoiled. This can be explained by Edmond's hypothesis which states that twist of the umbilical cord is a result of the rotary movement imparted to the embryo, and hence more is the liquor amnii, more is the rotary movement of the fetus and more will be the coiling. The converse will be true for oligohydramnios. Patil et al,^[16] evaluated the perinatal outcome with the abnormal umbilical cord coiling index. There was a significant correlation between the hypercoiled cords (UCI >90th percentile) and IUGR of the babies and low ponderal indices. Hypocoiled cords (UCI which was < 10th percentile) were significantly associated with meconium staining, Apgar score at 1 min of <4 and at 5 min of <7, LSCS rates and NICU admissions. Hypercoiled cords or UCI which was > 90th percentile was associated with IUGR and low ponderal indices. Hypocoiled cords or UCI which was <10th percentile was associated with meconium staining, Apgar score at 1 min of <4 and at 5 min of <7, more LSCS rates and more NICU admissions.

CONCLUSION

Abnormal coiling index is associated with adverse perinatal outcomes. Antenatal study of UCI should be further pursued to confirm diagnosis at an earlier gestational age.

REFERENCES

1. Strong TH, Jarles DL, Vega JS, Feldman DB. The umbilical coiling index. *AmJ Obstet Gynecol.* 1994; 170:29-32.
2. Lacro RV, Jones KL, Benirschke K. The umbilical cord twist: origin, direction, and relevance. *Am J Obstet Gynecol.* 1987;157:833-38.
3. Strong TH, Finberg HL, Mattox JH et al. Antepartum diagnosis of noncoiledumbilical cords. *Am J Obstet Gynecol.* 1994;170:1729- 33.
4. Ercal T, Lacin S, Altunyurt S, Saygili U, Cinar O, Mumcu A. umbilical coiling index: Is it a marker for the foetus at risk? *Br J ClinPract.* 1996; 50:254-56.
5. Rana J, Ebert GA, Kappy KA. Adverse perinatal outcome in patients with an abnormal umbilical coiling index. *Obstet Gynecol.* 1995; 85:573-77.
6. Battaglia FC, Lubchenco LO. A practical classification of newborn infants by weight and gestational age. *J Pediatr* 1967; 71:159-63.
7. Van Dijk CC, Franx A, De Latt MWM, Bruinse HW, Visser GHA, Nikkels PGJ. The umbilical coilingindex in normal pregnancy. *J Matern Fetal Neonatal Med* 2002;11:280- 83.
8. Machin GA, Ackerman J, Gilbert BE. Abnormal umbilical cord coiling is associated with adverse perinatal outcomes. *Pediatr Dev Pathol.* 2000;3:462-71.

9. Strong TH, Elliot JP, Radin TG. Noncoiled umbilical blood vessels: A new marker for the fetus at risk. *Obstet Gynecol.* 1993;81:409-11.
10. Blickstein I, Varon Y, Varon E. Implications of the differences incoiling indices at different segments of the umbilical cord. *Gynecol Obstet Invest.* 2001; 52:203-06.
11. Tripathy S. and Its Relationship with Perinatal Outcomes. *Indian journal of neonatal Medicine and Research.* 2014 Oct;2(2):1-4.
12. Chitra T, Sushanth YS, Raghavan S. Umbilical coiling index as a marker of perinatal outcome: an analytical study. *Obstetrics and Gynecology international.* 2012 Feb 14;2012.
13. Gupta S, Faridi MMA, Krishnan J. Umbilical coiling index. *J Obstet Gynecol India.* 2006;56(4):315-19.
14. Devaru D, Meghna T. Umbilical coiling index & the perinatal outcome. *J Obstet Gynecol India.* 2012;62(1):43-46.
15. Kashanian M, Akbarian A, Kouhpayehzadeh J. The umbilical coiling index and adverse perinatal outcome. *International Journal of Gynecology & Obstetrics.* 2006;95:8-13.
16. Patil NS, Kulkarni SR, Lohitashwa R. Umbilical cord coiling index and perinatal outcome. *Journal of Clinical & Diagnostic Research.* 2013 Aug 1;7(8).