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AN OBSERVATIONAL STUDY ON CORRELATION BETWEEN UMBILICAL CORD COILING AND PERINATAL OUTCOME.

Gynecology

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ABSTRACT

A lot of studies done till date, on the effect of umbilical cord coiling, which unveiled a diversity in perinatal outcomes. The association of hypercoiling and thinning of the cord with consecutive constriction of the umbilical vessels are observed with intrauterine fetal death. Thus hypercoiling and hypocoiling are observed associated with multifaceted perinatal outcomes [9,11,13,18].

Here, in this study, the evaluation of umbilical cord coiling along with perinatal outcome was done to signify the importance of antenatal diagnosis of abnormal umbilical cord coiling (with the help of ultrasound at second trimester) for categorization of high risk pregnancies and to take the adequate precaution to prevent or to minimize the complications endangering the fetus and or the mother[10].

Materials and methods :-This study was done among 250 mothers, who were giving birth at labour ward (for Vaginal delivery) and at emergency OT (for EM LSCS). The study was conducted at a tertiary care hospital in South-Bengal over a period of one year, from 1st September,2017 to 31st August, 2018.

Study design :A Cross-Sectional study

Result : Total 250 cases were studied, Among them 64.4% were primigravida and 35.6% were multigravida , where the results did not show any significant variation in perinatal outcome. Cases, where the Umbilical-cord Coiling Index (UCI) > 90th percentile, were associated mainly with IUGR and cases with UCI < 10th percentile were associated with Meconium stained Liquor, more incidence of EM LSCS, low Birth-Weight, low APGAR and more SNCU / NICU admissions.

Conclusion : It is established that abnormal UCI is associated with adverse perinatal outcome. Observing the results of our study, which is once more establishing the gravity of the abnormal UCI on fetal morbidity and mortality, we now must think of the justification of antenatal detection of UCI, seriously, which may identify fetus at risk earliest and thus we can buy the time to manage the complications in proper way and in proper time.

KEYWORDS

Umbilical-cord Coiling Index (UCI), Hyper-coiling, Normo-Coiling, Hypo-coiling, Perinatal outcome.

BACKGROUND

We all know, how the umbilical cord is vital to the development, well-being and survival of the fetus in-utero. But, we must admit that, in no other part of feto-placental unit, blood vessels are so vulnerable for kinking, compression, traction and torsion, along with their consequences. The protection of umbilical vessels are provided by Wharton's Jelly, the amniotic fluid and the helical pattern or coiling of umbilical-cord vessels[4]. As a recapitulation, the average length of umbilical cord is 55 cm with an usual range of 30-100 cm and its diameter varies from 0.8 cm to 2.0 cm. A 'Coil' is defined as completed 360^0 spiral course of umbilical vessel around the Wharton's Jelly[5]. Strong et. al named this coil as "Umbilical Coiling Index" (UCI) and that is 1 coil / 5 cm[5,18]. The exact cause of abnormal cord coiling is not known. But the condition seen associated with thrombosis of chorionic plate vessels, umbilical venous thrombosis and cord stenosis. Thus abnormal umbilical cord coiling seems to be a chronic state, may be established in early gestation that may have chronic effects mainly on fetal well being [5,13,18].

That is the reason, why antenatal detection of abnormal cord coiling, by ultrasound, is so important and justified, which may help us, to diagnose the fetuses at risk, in optimum time, aiming to manage the situation to reduce the fetal morbidity and mortality. At the same time, abnormal UCI, if terminated electively, may give the chance of doing the pathological examination of the cord and, or, the whole placenta to gain more knowledge about the pathogenesis and, the effect of umbilical cord coiling. But in our study, we could not formulated the antenatal diagnosis and the postnatal pathological examination due to some limitations. And thus again the gravity of the abnormal coiling index with the adverse perinatal outcome is judged and reported here. The normal umbilical cord coiling index is "1 coil of Vessel / 5 cm" [1,2,3,5,6,9,13,18]. And the abnormal UCI included here, both the hypocoiled cords (cords with UCI < 10th percentile) and hypercoiled cords (cords with UCI > 90th percentile).

OBJECTIVE :

1. To establish the effects of abnormal Umbilical cord coiling o n perinatal outcome.

MATERIALS & METHOD :

The present study was done retrospectively among 250 mothers, admitted in our admission days, at Calcutta National Medical college and Hospital, and delivered consequently-- over a period of 1 year from 1st September, 2017 to 31st August, 2018.

THE INCLUSION CRITERIA WERE:

1. Healthy women with term gestation mainly.
2. Some preterm deliveries.
3. Singleton pregnancy.
4. Delivery by both vaginal and LSCS.

THE EXCLUSION CRITERIA WERE :

1. multifetal pregnancy,
2. intrauterine death,
3. pregnancy with medical diseases
4. Rh – negative pregnancy,
5. abnormal placental conditions (clinical) like, Placenta previa,
6. Previous caesarian section,
7. CPD / contracted outlet.

THE PARAMETERS STUDIED HERE :

1. length of umbilical cord in cm (post-delivery)
2. number of vascular coiling of umbilical cord
3. gravidity
4. IUGR
5. Meconium staining of liquor.
6. Mode of delivery.
7. APGAR score at 1 minute.
8. APGAR score at 5 minute,
9. weight of the body,
10. NICU / SNCU admission.

RESULT -ANALYSIS

Table 1 : Distribution Of Uci (umibilical Cord Coiling Index)

UCI	Number of neonates (n=250)	%
Normo - coiling	195	78
Hypocoiling = (10th percentile)	29	11.5
Hypercoiling = (> 90th percentile)	26	10.5
Total	250	100.0

In the present study, UCI < 10th percentile, is considered as hypocoiling and UCI > 90th Percentile, is considered as hypercoiling[16].

This table represents the study of 250 patients, out of which 195 (78%) had normocoiling cord, i.e. between 10th to 90th percentile, 29 cases (11.5%) had hypocoiling, where 26 cases (10.5%) had hypercoiling.

TABLE 2A : IUGR

Baby details (n=250)	Criteria	Number of Neonates	%
IUGR	Yes	27	11.0
	No	223	89.0
Total		250	100.0

TABLE 2B : CORRELATION OF IUGR WITH UCI

Baby details (n=250)	Normocoiling	Hypo-coiling	Hypercoiling
IUGR " + " (n=27)	2 (7.40%)	4 (14.8%)	21 (81.0%)
IUGR " – " (n = 223)	193 (86.54%)	25 (11.21%)	5 (2.24%)
Total	195	29	26

Out of 250 babies, 27 (11.0%) had IUGR, out of which 2 (7.40%) cases had normocoiling cord; 4 cases (14.81%) had hypocoiling and 21 (81.0%) had hypercoiling cord.

223 (89%) babies did not have IUGR, Out of which 193 (86.54%) had normocoiling, 25 (11.21%) had hypocoiling and 5 (2.24%) had hypercoiling .

Thus this table showing hypercoiled cords were significantly associated with IUGR [1,2].

TABLE 3A : MECONIUM STAINED LIQUOR

Baby details (n = 250)	Criteria	Number of neonates	%
Meconium Staining	Yes	53	21.0
	No	197	79.0
Total		250	100.0

TABLE 3B: CORRELATION OF MECONIUM STAINING WITH UCI

Baby details (n = 250)	UCI		
	Normocoiling	Hypocoiling	Hypercoiling
Meconium Staining '+' (n = 53)	6 (11.32%)	29 (54.71%)	18 (9.5%)
Meconium Staining '-' (n = 197)	189 (89.11%)	0 (0.0%)	8 (90.5%)
Total	195	29	26

Out of 250 cases, studied, 53 (21.0%) had meconium stained liquor. Out of which 6 (11.32%) had normocoiling; all 29 cases of hypocoiling status, had meconium stained liqour and 18 (33.96%) had hypercoiling.

197 cases did not have meconium in their liquor. Out of them, 189 (95.93%) cases had normocoiling cord; none of from hypocoiling group and 8 (4.06%) hypercoiling cases had no meconium.

So, this table is supporting that meconium staining is more associated with hypocoiled umbilical cord [1,2].

TABLE 4 : CORRELATION OF MODE OF DELIVERY WITH UCI

Maternal variables (n = 250)	UCI		
	Normocoiling	Hypocoiling	Hypercoiling
VD	126 (64.61%)	8 (27.58%)	10 (38.46%)
EMLSCS	69 (35.38%)	21 (72.41%)	16 (61.53%)
Total	195	29	26

UCI was found correlated with mode of delivery.

Among 195 normocoiling cases, 126 cases were seen had vaginal deliveries (VD), that means 64.61% cases had VD; and 69 (35.38%) had EMLSCS.

Among 29 hypocoiled umbilical cords, 8 cases (27.58%) had VD, whereas 21 cases (72.41%) had EMLSCS.

And 26 hypercoilings had VD in 10 cases (38.46%), whereas 16 cases (61.53%) had EMLSCS.

Thus this observation is showing that LSCS cases were significantly high in hypocoiled group.

TABLE 5A : BIRTH WEIGHT

Baby details (n = 250)	Criteria	Number of neonates	%
Birth weight (In Kg.)	< 1 Kg	0	0.0%
	1.0 – 1.45 Kg	1	0.4%
	1.50 – 2.45 Kg	33	13.2%
	2.50 – 3.50 Kg	201	80.40%
	> 3.50 Kg	15	6.0%
Total		250	100.0

TABLE 5B : CORRELATION OF BIRTH WEIGHT AND UCI

Baby details (Birth weight in kg) N = 250	UCI		
	Normocoiling	Hypocoiling	Hypercoiling
< 2.5	6 (3.07%)	20 (68.96%)	8 (30.76%)
2.5 – 3.5	174 (89.23%)	9 (31.03%)	18 (69.23%)
> 3.5	15 (7.69%)	0	0
Total	195	29	26

UCI is correlated with birth weight of the babies.

Among 195 cases of normocoiling cords, 6 were < 2.5 Kg (3.07%), 174 (89.23%) babies were of between 2.5 – 3.5 Kg and 15 (7.69%) babies had > 3.5 Kg birth weight.

Whereas, out of 29 hypocoiling cases, < 2.5 Kg babies were 20 (68.96%) in number;

Within 2.5 to 3.5 Kg there were 9 (31.03%) babies and no baby was > 3.5 Kg. Most of low birth weight babies were due to preterm deliveries and following obstetric complications. Out of 26 hypercoiling cases, < 2.5 Kg babies were 8 (30.76%); and between 2.5 to 3.5 kg,-- 18 (69.23%) babies were there.

So, these observations are interpreting that, hypocoiled cords were significantly associated with low birth weight babies.

TABLE 6A : APGAR SCORE AT 1 MINUTE.

Baby details	Criteria	Number of Neonates (n = 250)	%
APGAR Score at 1 Minute	< 4	39	15.6
	> 4	211	84.4
Total		250	100.0

TABLE 6B: CORRELATION OF APGAR SCORE AT 1 MINUTE WITH UCI

Baby details (n = 250)	UCI		
	Normo-coiling	Hypo-coiling	Hyper-coiling
APGAR Score at 1 Minute			
< 4.0 (n = 39)	2 (5.12%)	28 (71.79%)	9 (23.07%)
> 4.0 (n = 211)	193 (91.46%)	1 (0.47%)	17 (8.05%)
Total	195	29	26

39 babies (15.6%) had APGAR score at 1 minute - <4. Out of them, 2 (5.12%) cases had normocoiling cords; 28 (71.79%) had hypocoiling and 9 (23.07%) cases had hypercoiling.

And 211 babies (84.4%) had APGAR score at 1 minute - >4. Out of them, 193 (91.46%) babies had normocoiling cords; 1 (0.47%) had hypocoiling and 17 (8.05%) cases had hypercoiling status.

Thus this table is interpretating that hypocoiled cords were significant for causing less APGAR score at 1 minute.

TABLE 7A : APGAR SCORE AT 5 MINUTES

Baby details (n = 250)	Criteria	Number of Neonates	%
APGAR Score at 5 Minute	< 7	35	14.0
	> 7	215	86.0
Total		250	100.0

TABLE 7B : CORRELATION OF APGAR SCORE AT 5 MINUTE WITH UCI

Baby details (n = 250)	UCI		
	Normo-coiling	Hypo-coiling	Hyper-coiling
APGAR Score at 5 Minute			
< 7.0 (n = 35)	3 (8.57%)	23 (65.71%)	9 (25.71%)
> 7.0 (n = 215)	192 (89.3%)	6 (2.79%)	17 (7.90%)
Total	195	29	26

35 babies (14.0%) had APGAR Score at 5 minute - < 7. Out of them 3 (8.57%) recorded as normocoiling status; whereas 23 (65.71%) cases had hypocoiling cords and 9 (25.71%) had hyper coiling cords.

215 (86.0%) babies attended Apgar Score at 5 minute - > 7. And out of them, 192 (80.0%) babies had normocoiling cords; whereas 6 (2.79%) had hypocoiling and 17 (7.90%) had hypercoiling.

Here also, it was found that hypocoiled cords were most responsible variety for < 7 APGAR score at 5 minute.

TABLE 8 : CORRELATION OF NICU / SNCU ADMISSION AND UCI.

Baby details (n = 250)	UCI		
	Normo-coiling	Hypo-coiling	Hyper-coiling
NICU / SNCU Admission --			
Yes	7 (3.58%)	24 (82.75%)	13 (50.0%)
No	188 (96.41%)	5 (17.24%)	13 (50.0%)
Total	195	29	26

Out of 195 normocoiling cases, 7 (3.58%) had NICU / SNCU admissions for prolonged labour in - 4 cases and PPROM in 3 cases; whereas 188 (96.41%) babies did not require NICU / SNCU admission.

But out of 29 hypocoiling cases, 24 (82.75%) babies required NICU / SNCU admission.

And 13 (50 %) hypercoiling cords needed NICU / SNCU admission. The study show a strong significance of hypocoiled cords attended NICU / SNCU Admissions.

DISCUSSION

This was a prospective clinical study, conducted in the Department of Obstetrics and Gynecology at Calcutta National Medical College and Hospital from 1st September,2017 to 31st August,2018. 250 women, who fulfilled the criteria stated above, were taken for the study. UCI was measured by dividing the total number of vascular coils of the umbilical cord by the total length of the cord in centimeter [3]. Perinatal factors like – normal status and intrauterine growth retardation, meconium staining of liquor, mode of delivery, birth weight, APGAR Score at 1 minute, APGAR Score at 5 minute and NICU/SNCU admission – all were recorded. This study observed that there is a definite clinical correlation of the perinanal outcome with the umbilical-cord coiling index (UCI) . Increased incidence of MSL,EMLSCS and LBW babies along with low APGAR and more NICU/SNCU admissions were observed associated with Hypocoiled group[3,4,5,9,18]. Whereas Hypercoiled group was found significantly associated with IUGR babies[2,4,8].

Limitations of the Study ----------There were certain limitations of the study, we faced. One of them definitely was the sample size, which we could not increase involving the other admission days properly. Obviously the perinatal outcome could have been correlated more preciously, if sample size was much larger. And the other limitation was the failure of establishing an efficient concert with the Radiology Department for Antenatal diagnosis of UCI, due to huge population they tackle and comparatively less manpower.

CONCLUSION

The umbilical cord along with the vital blood vessels are the most vulnerable part of fetal anatomy. The total number of coils of the vessels for any particular cord is believed to be established early in gestation. In consideration of the abnormal coiling index and its correlation with the adverse perinatal outcome in present study, it was observed that 10th and 90th percentile for UCI were in agreement with the previous studies. And as because the status could be diagnosed antenataly as early as in second trimester[6,7,15], by sonography, we can identify the fetus at risk, far before the delivery , which can help us to formulate the management of the complications at earliest, to reduce perinatal morbidity and mortality.

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