ASSESSMENT OF UMBILICAL COILING INDEX AS A MARKER OF PERINATAL OUTCOME

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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.

Table 1: Umbilical coiling index

<table>
<thead>
<tr>
<th>Umbilical coiling index</th>
<th>Number</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normocoiled</td>
<td>70</td>
<td>0.01</td>
</tr>
<tr>
<td>Hypocoiled</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Hypercoiled</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Assessment of umbilical coiling index and perinatal outcomes

<table>
<thead>
<tr>
<th>Perinatal factors</th>
<th>Normocoiled</th>
<th>Hypocoiled</th>
<th>Hypercoiled</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm delivery</td>
<td>7</td>
<td>4</td>
<td>10</td>
<td>0.04</td>
</tr>
<tr>
<td>Amniotic fluid index (&lt;6)</td>
<td>12</td>
<td>5</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>PIH</td>
<td>10</td>
<td>8</td>
<td>9</td>
<td>0.16</td>
</tr>
<tr>
<td>Meconium staining</td>
<td>26</td>
<td>16</td>
<td>2</td>
<td>0.09</td>
</tr>
<tr>
<td>LBW</td>
<td>25</td>
<td>11</td>
<td>15</td>
<td>0.70</td>
</tr>
<tr>
<td>Antepartum and intrapartum fetal distress</td>
<td>21</td>
<td>12</td>
<td>5</td>
<td>0.82</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>APGAR score at 5 min</th>
<th>Normocoiled</th>
<th>Hypocoiled</th>
<th>Hypercoiled</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6</td>
<td>8</td>
<td>14</td>
<td>13</td>
<td>0.05</td>
</tr>
<tr>
<td>&gt;6</td>
<td>62</td>
<td>8</td>
<td>5</td>
<td>0.01</td>
</tr>
</tbody>
</table>

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.\(^7\)

\(^{7,8}\)
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. 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. We performed this study to assess umbilical coiling index as a marker of perinatal outcome.

Our results showed that There were 70 normocoiled, 22 hypociled and 18 hypercoiled cases. Tripathy assessed any adverse perinatal outcomes associated with abnormal coiling of umbilical cord. 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 hypocited, 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 hypociled and 10 hypercoiled cases. Amniotic fluid index (<6) was seen in 12 normocoiled, 5 hypociled and 2 hypercoiled cases. PIH was seen in 10 normocoiled, 8 hypociled and 9 hypercoiled cases, meconium staining was seen in 26 normocoiled, 16 hypociled and 2 hypercoiled cases, low birth weight was seen in 25 normocoiled, 11 hypociled and 15 hypercoiled cases, antepartum and intrapartum fetal distress was seen in 21 normocoiled, 12 hypociled and 5 hypercoiled cases. Chitra et al. measure umbilical coiling index (UCI) postnatally and to study the association of normocoiling, hypocoiding and hypercoiling to maternal and perinatal outcome. One thousand antenatal women who went into labour were studied and observed that incidence of noncoiled umbilical cords. Am J Obstet Gynecol. 1994; 170:29-32.

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.

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