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Role of USG in assessment of umbilical cord thickness

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Abstract
Background: For many years, evaluation of umbilical cord morphology was restricted to the post-partum period and was performed by pathologists who demonstrated that a thin umbilical cord was associated with adverse pregnancy outcome. Hence; the present study was undertaken for assessing the role of USG in assessment of umbilical cord thickness.
Materials and methods: A total of 100 pregnancy subjects were included in the present study that was schedule to undergo USG. Ethical approval was obtained before the starting of the study. Written consent was obtained from all the patients after explaining in detail the entire research protocol. Only those patients were included in the present study that had gestational age of more than 20 weeks at the time of USG. Umbilical cord thickness, cross-sectional area, and coiling index were measured in a free-floating loop of umbilical cord using the software in the USG unit. The newborns were considered as low birth weight (LBW) when the birth weight was below 2500 g. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.
Results: Mean gestational age of the patients was 37.9 weeks. Mean birth weight was 3569.1 grams. 20 patients were found to be with low birth weight. Mean umbilical cord thickness was 1.59 while mean umbilical cord area was 108. Mean coiling index was found to be 0.52.
Conclusion: In uterine examination of pregnant subjects, ultrasonography is a useful tool. However; further studies are recommended.

Keywords: Ultrasonography, umbilical cord

Introduction
For many years, evaluation of umbilical cord morphology was restricted to the post-partum period and was performed by pathologists who demonstrated that a thin umbilical cord was associated with adverse pregnancy outcome. A lean umbilical cord was reported to be associated with small-for-gestational-age (SGA) neonates by Raio and colleagues. Goynumer *et al*, found significant differences in mean gestational age, mode of delivery, birth weight, and adverse perinatal outcome between fetuses with umbilical cord thickness below the 5th centile (lean umbilical cord) vs. those with umbilical cord thickness above the 5th centile (non-lean cord) in the first and early second trimesters of gestation [1, 3].
The umbilical cord (UC) is the essential life-sustaining connection between fetus and placenta. It constitutes a stable connection to the fetomaternal interface, while allowing fetal mobility that is essential for fetal development in general and neuromotor development in particular. This combination of mechanical stability and flexibility is due to the architecture of the UC. There is however a range of umbilical cord complications that may be life threatening to the fetus, and these too can be explained to a large extent by the Cord's structural characteristics [4, 6]. Hence; the present study was undertaken for assessing the role of USG in assessment of umbilical cord thickness.

Materials and Methods
The present study was conducted in the department of Radiodiagnosis with the aim of assessing the role of USG in assessment of umbilical cord thickness. A total of 100 pregnancy subjects were included in the present study that was schedule to undergo USG. Ethical approval was obtained before the starting of the study. Written consent was obtained from all the patients after explaining in detail the entire research protocol. Only those patients were included in the present study that had gestational age of more than 20 weeks at the time of USG. Umbilical cord thickness, cross-sectional area, and coiling index were measured in a free-floating loop of umbilical cord using the software in the USG unit.

Measurements were performed by marking the outer edges of the umbilical cord for thickness and by encircling the outer edge of the cord in transverse section for cross sectional area. The newborns were considered as low birth weight (LBW) when the birth weight was below 2500 g. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

Results

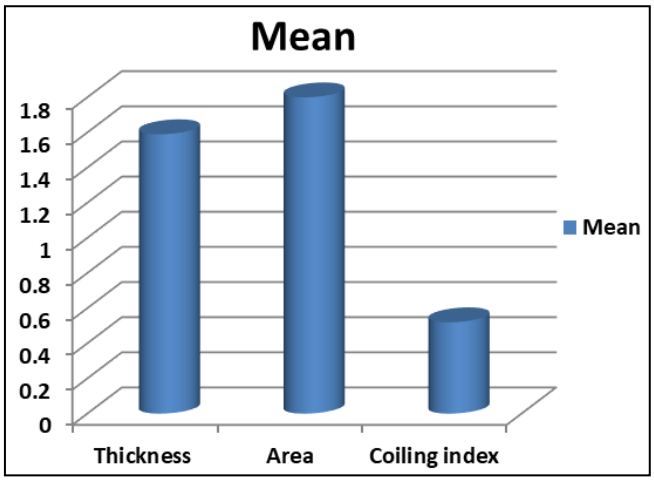
In the present study, a total of 100 subjects were enrolled. Mean gestational age of the patients was 37.9 weeks. Mean birth weight was 3569.1 grams. 20 patients were found to be with low birth weight. Mean umbilical cord thickness was 1.59 while mean umbilical cord area was 108. Mean coiling index was found to be 0.52.

Table 1: Demographic data

Variable	Value
Mean gestational age (weeks)	37.9
Mean birth weight (grams)	3569.1
Number of patients with low birth weight	20

Table 2: Umbilical cord anthropometric parameters

Variable	Mean	SD
Thickness	1.59	0.45
Area	1.8	0.53
Coiling index	0.52	0.11



Graph 1: Umbilical cord anthropometric parameters

Discussion

The delivery of a macrosomic infant has potentially severe consequences for both the newborn and the mother. Increased birth weight heightens the risk in the fetus of shoulder dystocia and permanent brachial plexus injury, and those infants weighing ≥ 4500 g are at increased risk for neonatal morbidity, including the need for assisted ventilation and meconium aspiration. Maternal complications result from operative delivery and include postpartum hemorrhage, third- or fourth-degree lacerations and postpartum infection. Despite the fact that current evidence does not support intervention for suspected macrosomia, maternity care professionals continue to search for accurate methods of predicting fetal weight in an effort to ameliorate the adverse outcomes that are associated with traumatic delivery [7, 9]. Hence; the present study was undertaken for assessing the role of USG in assessment of umbilical cord thickness.

In the present study, a total of 100 subjects were enrolled. Mean gestational age of the patients was 37.9 weeks. Mean birth weight was 3569.1 grams. 20 patients were found to be with low birth weight.

Tahmasebi M *et al* evaluated the relationship of sonographic measurements of umbilical cord thickness, cross-sectional area, and coiling index with pregnancy outcome (low birth weight, 5-min Apgar score, and meconium staining). Among 255 singleton pregnant women who were referred for routine pregnancy USG after 20 weeks of gestation, 223 fulfilled the study criteria. In these patients, the diameter, cross-sectional area, and coiling index were measured in a free loop of umbilical cord. The pregnancies were followed till delivery, when birth weight, presence of meconium staining, and 5-min Apgar score were recorded. A statistically significant correlation was observed between small umbilical cord thickness and cross-sectional area and low birth weight (LBW), with sensitivity of 52.9% and 57.9%, specificity of 95.0% and 94.4%, positive predictive value of 52.6% and 52.0%, and negative predictive value of 95.0% and 95.0%, respectively. Also noted was significant correlation between small umbilical cord thickness and cross-sectional area with meconium staining ($P< 0.001$). No significant correlation was seen between umbilical cord thickness and cross-sectional area with low 5-min Apgar score.

There was no statistically significant correlation between umbilical cord coiling index and LBW, 5-min Apgar score, and meconium staining. Umbilical cord diameter and cross-sectional area measured after 20 weeks of gestation are useful for predicting LBW and meconium staining and have the potential to serve as markers for adverse pregnancy outcome [8].

In the present study, Mean umbilical cord thickness was 1.59 while mean umbilical cord area was 108. Mean coiling index was found to be 0.52. Gupta S *et al* evaluate the value of umbilical cord thickness, cross-sectional area, and coiling index with Ultrasonography (USG). 140 pregnant women who underwent USG were included. Gestational age was based on a reliable last menstrual period or the earliest USG examination before 20 weeks of gestation. In all patients USG was performed using a 3.5-MHz convex transducer. Umbilical cord thickness, cross-sectional area, and coiling index were measured in a free-floating loop of umbilical cord using the software in the USG unit. Mean gestational age at delivery was 38.65± 2.4 weeks, mean birth weight was 3456± 483 grams, low birth weight was seen in 24 children, meconium stained amniotic fluid was observed in 5 cases and there was no intrauterine death. Mean thickness of umbilical cord was 1.52, 10th centile was 1.3, 90th centile was 1.9, area was 1.92, 10th centile was 1.2, 90th centile was 2.8 and coiling index was 0.5, 10th centile was 0.25 and 90th centile was 0.56. Thickness < 10th was 56%, 10-90th was 43%, coiling index 90th was 3%. Umbilical cord thickness and cross-sectional area are easy to measure in a free loop of umbilical cord and both are correlated with LBW and meconium staining in the second half of gestation. USG proves to be beneficial in uterine examination in pregnant women [9].

Conclusion

From the above results, the authors conclude that in uterine examination of pregnant subjects, ultrasonography is a useful tool. However; further studies are recommended.

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