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Original Research Article

Coiling of the Umbilical Cord in Sudanese

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ABSTRACT

A total number of 1020 umbilical cords were investigated. Singletons have higher number of coils per cord than twins without regard to the sex. Male babies have more coiled cords than female ones in singletons and its revers in twins. Normal pregnancies and outcomes suggested not being associated with non-coiled cords and non-helical umbilical vessels. Hypo and hypercoiled cords may occur in normal conditions.

Keywords: umbilical cord coils. Twisting umbilical vessels, Sudanese, Singletons, and Twins.

INTRODUCTION

Umbilical cord (UC) is formed by the fifth week of development and functions throughout pregnancy. [(1)] Coiling of the UC vessels develops as early as the 6th week and is well established by the 9th week of development. [(1-3)] The helical course of the umbilical vessels can be observed as early as 28 days post-conception, and is clearly visible from 7 weeks post-conception in 95% of all fetuses. [(4)] Many hypotheses have been assigned for UC coiling such like fetal movements, fetal hemodynamic forces, active or passive torsion of the embryo, differential umbilical vascular growth rates, and the arrangements of muscular fibers in the UC vessels wall. [(5, 6)] Hyper twisting or coiling may affect the neonatal outcomes. [(1, 2)]

The coiling of UC vessels is either sinistral (left) or dextral (right) or random, with the left twisting more common than right. [(7)] Mixed patterns of coiling have been observed. [(6,7)] Hypercoiling or straight cords with few or absent helices have been associated with adverse fetal growth and the birth weight. [(8-10)]

This study aims to investigate the coiling of the umbilical cord and patterns of umbilical vessels helices in normal pregnancies and outcomes.

MATERIALS AND METHODS

The UC coiling patterns were studied in 1020 full-term birth by the naked eye. Inclusion criteria include neonates of both of sex, single or twin birth of normal vaginal delivery. Exclusion criteria include stillbirth and abnormal vaginal deliveries. The study was done in Omdurman Maternity Hospital, in the duration from February to September 2013. Both verbal and written consent were taken.

Immediately after delivery, the UC was cut5cm from the baby abdominal wall (fetal end). The rest of the umbilical cord to the placenta insertion was measured. The fetal end to the placental insertion (placental end) was measured in centimeters. The five centimeters in the baby abdominal wall

added to the rest of the cord. Coil was taken as one complete 360-degree spiral course of the umbilical vessels. The number of coils of the entire cords was counted from placental to the fetal end. For coils direction, placental end of the cord was selected as start point, because the coils were seen visible.

To assess patterns of umbilical vessels arrangement, a blunt dissection was done along the umbilical cord. The patterns were observed and recorded.

Statistical Analysis

Data were analyzed using Statistical Package for Social Science version 16 (SPSS, V16. Aromonk, NY: IBM Corp, USA). Results presented as means±SD.

RESULTS

Out of all UC specimens, 584 (57.3%) were male cords and 436 (42.7%) were female cords, and 980 (96%) cords of single birth and 20 (4%) were of twin birth babies.

1. Umbilical cord coils

1.1. Number of coils in umbilical cord

Base on coils numbers, the cords were grouped as group A, cords with <10 coils (hypocoiled); group B, cords with coils arranged between 10-40 (normocoiled) and group C, cords with >40 coils (hypercoiled) (Table1).

Table 1: number of umbilical cord coilsin Sudanese.

Group	No of coils	Variable	Frequency	Percentage
A	< 10	Hypocoiled cord	232	22.7%
B	10- 40	Normocoiled cord	775	76%
C	> 40	Hypercoiled cord	13	1.3%
Total			1020	100%

1.2. Coils and birth outcomes

In singletons, the minimum number of coils is four per cord. Cords of male babies have the higher number of coils (45) than female babies (36). The minimum of coils per cord for twin babies is six. While cords of female babies have the higher numbers of coils per cord (32) (Table 2).

Table 2: Number of coils of per cord in Sudanese.

Birth outcome		Minimum	Maximum	Mean	SD
Single	Male	4	45	13.2	7.9
	Female	4	36	12.2	7.5
Twin	Male	6	18	13.0	4.8
	Female	6	32	15.2	10.1
Total neonate		1020			

2. Helical pattern of umbilical vessels

Base on the helical pattern umbilical vessels cords, cords were classified into three types. Type I, the arteries and vein have a parallel course, with vein centrally located and arteries on both sides. This pattern is associated with hypocoiled cord. Type II divided into two subtypes. Type II A, the vein is a predominantly straight with arteries coiled around it, and type II B, arteries and vein course together in a helical fashion in a one-to-one relationship. This pattern is associated with normocoiled cord. Type III, vessels showed irregular course; this pattern is associated with hypercoiled cord (table 3).

Table 3: Helical pattern of umbilical vesselsin Sudanese.

Group	Frequency	Percentage
Type I	57	5.6%
Type IIA	405	39.7%
Type IIB	464	45.4 %
Type III	94	9.2%
Total	1020	100%

3. Direction of umbilical cord coils

Out of all the UC specimens 759 (74.4%) were coiled sinistral and 261(25.6%) were coiled to dextral, from placental end of the cord, approximately 3:1.

DISCUSSION

Many researchers have studied the association between extremes number of coils per cord and pregnancies complications or adverse outcomes. [(11-13)] Both conditions of hypocoiled (<10) and hypercoiled (40>) cordshave been reported following normal pregnancies and outcomes. Non-coiled cords were not reported. This condition is reported to be

associated with abnormal pregnancies' or outcomes, thus the present findings confirm the previous studies.

Umbilical cords of male babies have the higher number of coils per cord. Female twins have the higher numbers of coils per cord for twin birth. Mean while four and six coils per cord are the minimum number of coils per single or twin birth respectively without regard to the sex of the baby.

The coiling of umbilical cord vessels in helical pattern has been identified, without consensus about the etiology and the benefits. [5] Recently a protective function has been mentioned. [14, 15] Many hypotheses have been postulated such as fetal movements, active or passive torsion of the embryo, [16] differential umbilical vascular growth rates and fetal hemodynamic forces, and the muscular fibers in the arterial wall. [4] Majority of the cords has a left-sided twist. [15] In approximately 2–5% of umbilical cords, there is no coiling at all. [4] Sinistral (left) spiraling is four to eight times more common than dextral (right) spiraling, and sometimes there is a mixed pattern of coiling. [4] The present study showed that all the umbilical vessels are twisted. In agreement with the previous study [4] the sinistral pattern is the dominant in spite the difference in the percentage which was 3:1 in the present findings.

The pattern of umbilical arteries arrangement around the vein is thought to have impact on blood transport to the fetus. [4, 17,18] More studies are in need to investigate the association between umbilical vessels arrangement and weight of outcomes.

CONCLUSION

The minimum number of coils per umbilical cord is for singletons and six for twins. Male babies have more coiled cords than female ones in singletons; this relation is revered in twins. Predominantly umbilical vessels are arranged in helical course around the vein. Both non-coiled cords and non-helical umbilical vessels were not recorded.

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