HELICAL PATTERNS OF UMBLICAL CORD A RANDOM STUDY

ARUN K. SHARMA ● NIRMALA SHARMA

SUMMARY

Helical patterns of the human umbilical cord have been studied on 250 full term cords from normal deliveries, 10 cords of the aborted but apparantly normal fetuses with a CR length of 1.2 to 12.0 cm, 10 cords of the malformed fetuses, and 10 cords from multiple births, including 6 cords from twins and 4 cords from quadruplets. The length of normal full term cords ranged from 26-112 cm. with a mode of 56 cm, and a mean of 52 cm. The various patterns noted in the normal full term cords were right twisting (63.6%) left twisting (17.6%) RL (8%), LR (2.8%) etc. Evidently uniform R-pattern was commonest, and the ration between R-pattern and L-pattern was 3.6 : 1 the mixed patterns were found in 17.6% cords.

Observations made on early fetuses indicate that twists start appearing during the early part of the eighth week of development and that the final number is attained soon after the ninth week of development.

The function of the twists in the umbilical cord as is generally understood, appears to be a structural adaptation to minimize the risk of occlusion of the vessels occasioned by pressures, snarls and torsions. In view of high preponderance of the R-twists, the role of liver and right-sided venous shift in mechanical turning of the foetus to its right side has also been suggested.

Dept of obst. & Gyn. Kota Medical College, Kota (Rajasthan).

INTRODUCTION

The vital role played by the umbilical cord or funis for the existence and normal

development of the fetus can not be over emphasized. The spiral or helical nature of the umbilical vessels is one of the most distinctive features of the cord, which has a close bearing on the haemodynamics of the placental as well as fetal circulations. The twists of the cord are a result of opposite twists in the fibers constituting the vessel walls, and these are genetically determined. The risk of snarls produced by torsion is minimised by the helical dispostion of the umbilical vessels. The present study aims at -

1. Recording the various helical patterns in the full term cords, with the incidence of each pattern.
2. Noting the frequency distribution of the number of uniform twists.
3. Correlating the twists with the length and thickness of the cords.
4. Stydying the time of appearance of the twists in the early fetuses.

MATERIAL AND METHODS

From Jan 92 to Dec 95 the study was done on 250 Full term cords from normal deliveries, 10 cords of the aborted normal fetuses, 10 cords of aborted malformed fetuses and 10 cords of multiple births. The material was obtained from the Kamala Raja Hospital, Gwalior. All cords were examined fresh without any fixation. The following observations were made on each cord -

1. The length of cord was measured in cm. (Caliper)
2. The thickness of the cord at its fetal and placental ends and midlength in mm.
3. The direction and number of the twists were noted from placental to fetal end.

If the twist was directed towards the observer's right side it was noted as R-type, & when it was directed towards the observer's left side it was L-type.

4. Cut end of the cord was examined for single umbilical artery.
5. False knots, true knots, varicosities and insertion of the cord were noted.
6. Correlations between the thickness of the cord and uniform types of twists were noted.
7. The concordance and discordance in the patterns of twists in the twins were noted.
8. In the malformed fetuses an attempt has been made to find out the correlation, if any between the deformity and the twist.

OBSERVATIONS

The analysis of the length and thickness of 250 normal full term cords is shown in Table - I. The length of the normal full term cords ranged from 26 to 112 cm, with a median of 54 cm, a mode of 56 cm, and a mean of 52.1. The thickness of cord at three sites does not seem to differ significantly.

The commonest helical pattern was of uniform R - type (63.6%) and next common was uniform L - type (17.6%). In 1.2% cords the coiling was missing (Table - II).

Table III Shows the correlation between the length of the cord and

TABLE I

S.No.	Parameter	Range	Median	Mode	Mean
1.	Length (cm.)	26 - 112	54	56	52.1
2.	Placental end - thickness (mm)	5.5 - 18	9.5	8	7.7
3.	Mid-thickenss (mm)	4.5 - 16	8.5	7.5	7.9
4.	Foetal end-thickness	4.5 - 14	8.5	8	8.4

TABLE II
HELICAL PATTERN OF 250 NORMAL FULL TERM CORDS

S. No.	Pattern	Number of Cords	Percentage
1.	R	159	63.6
2.	L	44	17.6
3.	RL	20	8.0
4.	LR	7	2.8
5.	R L R	8	3.2
6.	L R L	1	0.4
7.	R L R L	2	0.8
8.	L R L R	-	-
9.	R- Indeterminate	1	0.4
10.	L - Indeterminate	-	-
11.	Indeterminate - R	-	-
12.	Indeterminate - L	-	-
13.	Indeterminate	5	2.0
14.	Absent	3	1.2

TABLE III
CORRELATION BETWEEN LENGTH AND NUMBER OF R - TWISTS IN 159 NORMAL FULL TERM CORDS

Length (cm.)	Number of R - twists					
	1-5	6-10	11-15	16-20	21-15	26-30
15-20	-	-	-	-	-	-
21-30	3	-	-	-	-	-
31-40	10	7	1	-	-	-
41-50	27	30	3	-	-	-
51-60	19	21	9	1	-	-
61-70	1	8	4	1	-	-
71-80	1	5	1	1	-	-
81-90	1	-	-	1	-	1
91-100	-	1	-	1	-	-
101-110	-	-	-	-	-	-
111-120	-	-	-	1	-	-
Total	62 (39%)	72 (45.3%)	18 (11.13%)	6 (3.8%)	-	1 (0.6%)

number of uniform R-twists. Number of these twists varied from 1 to 29, observed in 159 cords. The majority (84.3%) of the cords in R-type series had 1-10 twists and length within a range of 41 to 50 cm.

The number of L - twists, in the cords of either less than 41 cm or more than 60 cm length, decreased progressively. (Table - IV).

The uniform R - twists ranged from 1 to 29, with a median of 11, a mode of 6, and a mean of 7.5 the uniform L - twists ranged from 1 to 17, with a median of 7, a mode of 6 and a mean of 6.3 (Table V)

DISCUSSION

The present study favours the concept of the Neugevauer (1858) and Stoeckel (1905) that the number of twists in the full term cords does not depend on their length.

Helical nature of the cord has been explained in a number of ways.

1. Movement of fetus in amniotic fluid (Schneider, 1857)
2. Greater size of the right

TABLE IV
CORRELATION BETWEEN LENGTH AND L - TWISTS IN 44 NORMAL FULL TERM CORDS

Length (Cms)	Number of L- twists			
	1-5	6-10	11-15	16-20
15-20	-	2	-	-
21-30	-	2	-	-
31-40	4	2	-	-
41-50	8	5	3	-
51-60	8	8	1	-
61-70	-	1	1	1
71-80	-	-	-	-
81-112	-	-	-	-
Total	20 (45.5%)	18 (40.9%)	5 (11.4%)	1 (2.3%)

TABLE V
ANALYSIS OF R - AND L TWISTS IN 203 NORMAL FULL TERM CORDS

Analysis of twists	Helical pattern	
	R - type	L - type
Range	1 - 29	1 - 17
Median	11	7
Mode	6	6
Mean	7.5	6.3
Number of cords	159	44

TABLE VI
VARIATIONS AND ANOMALIES IN 250 NORMAL FULL TERM CORDS

Variations		Number of cords	Percentage
A.	False knots (Snarls,)		
1.	One Snarls	53	21.3
2.	Two Snarls	13	5.2
3.	Three Snarls	7	2.8
4.	Four Snarls	1	0.4
5.	Five Snarls	1	0.4
B.	True Knots		
1.	One knot	1	0.4
2.	Two knots	1	0.4
3.	Three knots	1	0.4
C.	Insertion of cord		
1.	Battledore	5	2.0
2.	Velamentous	2	0.8
D.	Varicosities		
1.	One	95	38.0
2.	Two	58	23.2
3.	Three	19	7.6
4.	Four	4	1.6
5.	Five	2	0.8
E.	Single umbilical artery	4	1.6

common iliac artery causing R-twisting (Simpson 1859)

3. Greater length of vessels than the cord (Maclenan 1966).

4. Malpas and Symonds (1966) believed that intrinsic twists in the constituent fibres of the vessel walls was genetically determined.

The right half of the body is heavier than the left half, on account of the liver and a considerable venous shift to the right side, thus accounting for a very high incidence of right helical pattern. With this, however it is difficult to explain the left helical pattern and a variety of combinations of these patterns seen in the full term cords. It is possible that helical nature of the cord is controlled by more than one factor, which may be partly genetic and partly environmental.

REFERENCES

1. *Malpas P & Symonds EM : Surs: Gynec. Obstet 123, 746 : 1966.*
2. *Melennan (1966) Synopsis of obst. 7th Edi. C.V. Mosby, Saint Louis.*
3. *Neugebasser (1858) Morphological stiudy of umbilical cord cited by Shordania 1929.*
4. *Simpson Edinburgh medical J. (1859) cited by Shordania 1929.*
5. *Stoekel (1905) Handbuch Von winckel 2 III cited by Shordania, 1929.*
6. *Schneider Von der. Kolk (1857) cited by Shordania 1929.*
7. *Shordania J. : Uber das Gegassystem der Nabel Sehnur, 2ts chr. f.d. Anat., 89: 696, 1929.*