

OBSERVATIONS ON THE INSERTION AND THE COILING OF THE UMBILICAL CORD

by

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The umbilical cord originates as a mass of chorionically derived mesoblast at the caudal end of the embryonic disk when the latter develops its longitudinal axis during the 14th to 16th day of gestation. It connects the body of the foetus to the placenta. The type of its insertion is determined at the time of the implantation. It is usually inserted eccentrically upon the foetal surface of the placenta somewhere between its centre and periphery. A central insertion is less common while battledore and velamentous insertions are infrequent. Eastman (1961) has reported the insertion of the cord as eccentric 73 per cent, central 18 per cent, battledore 7 per cent and velamentous 1.25 per cent. Velamentous insertion is nine times more common in twins (Greenhill 1955).

Napier (1882) found that cords vary in length from 5 to 175 cms. with an average of approximately 50 cms. Eastman (1961) has stated that generally the average cord length is 55 cms., the range being 0.5 to 198 cms.

In placenta praevia it may be 20 cms. so that it can reach from its placental insertion to the vulva. Occasionally, long umbilical cords twist around the neck or the body of the foetus and thus become relatively short. Usually the difficulty does not arise in the delivery of the child in such cases, but rarely shortness of the cord may lead to abruptio placentae, rupture of the cord, inversion of the uterus and umbilical hernia of the foetus. A correlation between the cord length and the number of loops around the neck has been demonstrated by Shui and Eastman (1957). According to Bursztein, (1962) a single loop is possible if the umbilical cord measures more than 35 cms., double loop with 55 cms. and triple loop with 75 cms.

Dippel (1964) states that newborns with cord entanglements require resuscitation and there is a higher accompanying incidence of meconium-stained amniotic fluid as well as foetal heart irregularities.

Material and Methods

Gross examination of 343 placentae was done. The length of the umbilical cord was measured accurately in each case. It included the segment of the umbilical cord attached to the

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infant and the cord attached to the placenta. Insertion of the umbilical cord, number of loops, colour, haematoma, rupture, thrombosis, oedema, knotting, torsion, constriction and number of vessels were noted down. An attempt has been made to elucidate correlation of cord insertion, cord length and nuchal cord with maternal and foetal factors.

Variations in insertion

Type of insertion of the umbilical cord in 343 consecutive deliveries (including three sets of twins) is shown in Table I. Eccentric insertion is

common while battledore and velamentous are infrequent. Among the three sets of twins one placenta had velamentous insertion of the cord. The relationship of breech presentation with the insertion of the umbilical cord is shown in Table II. There is a tendency towards a higher incidence of breech presentation in association with the velamentous insertion of the cord.

The incidence of meconium-stained amniotic fluid with vertex positions according to the type of the insertion of the umbilical cord is shown in Table III.

TABLE I
Type of insertion of umbilical cord

| Type of umbilical cord insertion | Number of infants | Per cent |
|----------------------------------|-------------------|----------|
| Eccentric | 221 | 64.4 |
| Central | 91 | 26.6 |
| Battledore | 23 | 6.7 |
| Velamentous | 8* | 2.3 |
| Total | 343 | |

TABLE II
Type of insertion of umbilical cord in breech presentation

| Type of umbilical cord insertion | Number of infants | Breech No. | presentation % |
|----------------------------------|-------------------|------------|----------------|
| Eccentric | 221 | 5 | 2.3 |
| Central | 91 | 5 | 5.5 |
| Battledore | 23 | 0 | 0.0 |
| Velamentous | 8 | 3 | 37.8 |
| Total | 343 | 13 | 3.7 |

TABLE III
Incidence of meconium-stained amniotic fluid with vertex positions according to the type of insertion

| Type of umbilical cord insertion | Live Birth | | | Percentage of meconium stain |
|----------------------------------|----------------------|-------------------|-------|------------------------------|
| | No. without meconium | No. with meconium | Total | |
| Eccentric | 169 | 40 | 209 | 19.1 |
| Central | 72 | 12 | 84 | 14.3 |
| Battledore | 12 | 8 | 20 | 40.0 |
| Velamentous | 3 | 1 | 4 | 25.0 |

It is interesting to note that incidence of meconium-stained amniotic fluid is increased significantly in the battledore type of insertion.

No relationship was observed between the type of the umbilical cord insertion and the sex of the baby, size of the infant, the period of gestation, the age of mother, the parity or the shape of the placenta.

Coiling of the umbilical cord around the neck of the foetus

Incidence of coiling of umbilical cord in 343 deliveries (including 3 sets of twins) and the average cord length in relation to number of coils is shown in Table IV.

TABLE IV
Cord length in relation to number of loops

| Coils of cord around neck | No. of infants | Per cent | Average cord length in cms. | Range |
|---------------------------|----------------|----------|-----------------------------|--------|
| None | 269 | 78.4 | 49. | 25—109 |
| 1 | 57 | 16.6 | 56.2 | 33—75 |
| 2 | 14 | 4.1 | 60.2 | 55—103 |
| 3 | 1 | 0.3 | 97.0 | |
| 4 | 2 | 0.6 | 89.0 | |

One case with three coils and one case with 4 coils were delivered by lower segment caesarean section. In both the cases there was gross foetal distress. Both the cases had tight coils of cord around the neck. In one of them there was great difficulty in the delivery of the head. Both the babies required resuscitation but did well in the neonatal period.

The overall incidence of coiling is 21.6 per cent. The increased cord length is an important predisposing factor to coiling of the cord. The average cord length in one coil series was 56.2 cms. but there were 8 cases in this series in which the cord length was less than 40 cms., suggest-

ing that coiling may occur even with short cords. It is possible that one coil may be seen even with the cord length of 33 cms. and two coils may occur with cord length of 55 cms. (Fig. 1).

The frequency of coiling of umbilical cord rises from 13.3 per cent in the group of cord length less than 40 cms. to 70 per cent in cases with cord length 80 cms. or more.

Incidence of coiling of the umbilical cord according to the type of insertion of the cord is shown in Table V. The coils are most frequent in association with battledore insertion. Coils in relation to period of gestation in weeks is shown in Table VI. Ten-

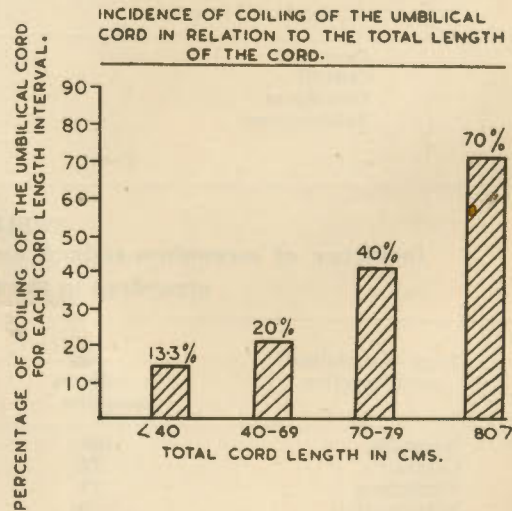


Fig. 1

TABLE V

Incidence of coiling of the umbilical cord according to the type of insertion of the cord

| Type of insertion | No. of infants | No. of infants with coils | Per cent |
|-------------------|----------------|---------------------------|----------|
| Eccentric | 221 | 45 | 20.4 |
| Central | 91 | 20 | 21.9 |
| Battledore | 23 | 7 | 30.4 |
| Velamentous | 8 | 2 | 25.0 |

TABLE VI

Coils in relation to period of gestation in weeks

| Period of gestation in weeks | No. of infants | With coils | |
|------------------------------|----------------|------------|------|
| | | No. | % |
| 28-37 | 28 | 4 | 14.3 |
| 38 and above | 197 | 57 | 28.9 |

dency to coiling increases with the increase in period of gestation. Coils appear to have no relation to vitality of the infant.

Incidence of meconium-stained liquor with vertex positions according to the coiling of the umbilical cord around the neck is shown in Table VII. The incidence of foetal asphyxia is high in cases with cord around the neck, specially if the insertion is of

battledore or velamentous type.

Coils in relation to Apgar scores are shown in Table VIII. Low Apgar scores are frequent in coiling cases. The relationship of coiling to birth weight is shown in Fig. 2; coils are more frequent in infants weighing more than 700 gms.

Fig. 3 shows that coils are common with the placentae weighing more than 350 grams.

TABLE VII

Incidence of meconium-stained liquor with vertex positions according to the coiling of the umbilical cord around the neck

| Group | Total live births | Meconium stained | |
|---------------------|-------------------|------------------|------|
| | | No. | % |
| Cases with coils | 69 | 16 | 23.2 |
| Cases without coils | 251 | 41 | 16.3 |

TABLE VIII

Coils in relation to Apgar Scores

| Group | Total No. of cases | Apgar score less than 5 | |
|---------------|--------------------|-------------------------|------|
| | | No. | % |
| Without coils | 231 | 25 | 10.8 |
| With coils | 64 | 10 | 15.6 |

NUCHAL COILS BY BIRTH WEIGHT.

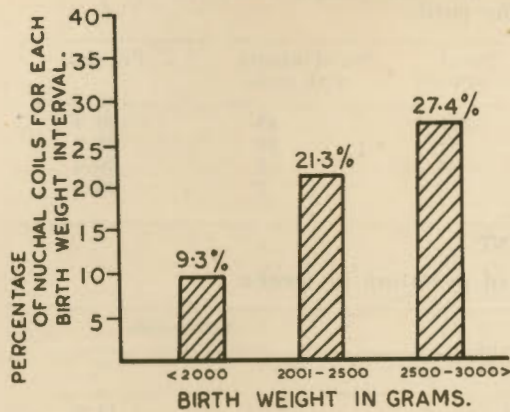


Fig. 2

NUCHAL COILS BY PLACENTAL WEIGHT.

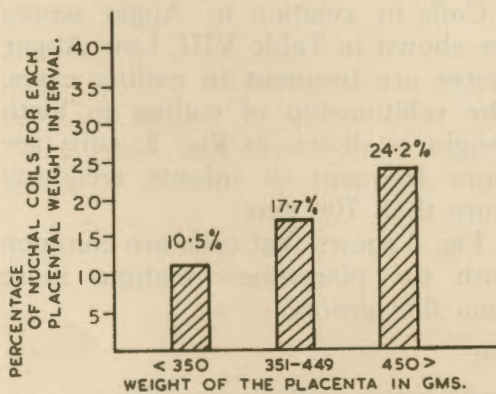


Fig. 3

Length of the cord

The cord length varied from 25 cms. to 109 cms. Average cord length was 56.0 cms. Long cords are more frequently associated with nuchal coils. Short cords are associated with the velamentous and battledore type of insertion, average length being 42.5 cms. and 49.7 cms. respectively in the velamentous cord and the battledore cord. There is no correlation of cord length with maternal

age, parity, infant size, infant weight and placental weight.

True knots

The incidence of true knots in this series was 1.1 per cent. They were not associated with foetal death.

Absent umbilical artery

One umbilical artery was absent in 4 cases. Two cases occurred among the stillbirths and were associated with multiple congenital abnormalities. The other two were livebirths.

*Summary**Insertion of the umbilical cord*

Gross examination of 343 placentae was done. Eccentric insertion was most common and velamentous insertion was infrequent. There was a tendency for the velamentous insertion to occur frequently in the twin placentae and breech presentation. Meconium staining of the liquor was increased in the battledore and velamentous insertion cases as the frequency of foetal asphyxia is increased considerably when they are associated with coils. Thus it may be concluded that the type of insertion of the umbilical cord often determines the frequency of umbilical cord complications and hence of foetal asphyxia.

No relationship could be demonstrated between the type of insertion of the cord and the sex of the baby, size of the infant, period of gestation, age of the mother, parity or shape of the placenta.

Coiling of the umbilical cord around the neck

The incidence of one coil of cord around the neck was 16.6 per cent, of

two coils 4.1 per cent, of three coils 0.3 per cent and that of four coils 0.6 per cent. A certain correlation exists between the cord length and the number of coils around the neck. The cord length is an important predisposing factor to coiling but it may occur occasionally with short cords. One coil is possible if umbilical cord measures 33 cms. and two coils 55 cms.

In regard to period of gestation, the infant weight and placental weight, as an aetiologic factor to coiling of the umbilical cord around the neck, it is of interest to note that there is an increased frequency of coils in infants more than 38 weeks of gestation, weighing more than 2000 grams and with placentas weighing more than 350 grams. However, these results suggest that coils usually occur late in pregnancy though occasionally coils may occur in premature fetuses also. Incidence of coiling is increased in the primiparous group as compared to multiparous.

The meconium staining of liquor and low Apgar scoring are of frequent occurrence in the coil cases.

Length of the cord

Average cord length was 56.0 cms. in the present series. The cord length varied from 25 cms. to 109 cms.

Long cords are more frequently associated with the nuchal coils. Short cords are associated with velamentous and battledore type of insertion, average length being 42.5 cms. in the velamentous type of insertion and 49.7 cms. in the battledore insertion. There was no correlation of cord length with placental weight, infant weight, sex of the infant, age of the mother and parity.

True knots occurred in 1.1 per cent of the cases. One umbilical artery was absent in 4 cases. Congenital malformations were significantly increased in infants with the absent umbilical artery.

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