

# PROLAPSE OF THE UMBILICAL CORD

(A Review of One Hundred and Eleven Consecutive Cases)

by

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Prolapse of the umbilical cord, though not a very frequent occurrence, is a major obstetrical complication, as it carries with it a very high foetal loss. As perinatal mortality due to other important causes has largely decreased in recent years, prolapse of the umbilical cord has assumed further relative importance as an important cause for foetal wastage.

In order to find out the important factors responsible for this complication and adversely affecting the foetal prognosis, a critical analysis of 111 cases of prolapse of the umbilical cord, that were admitted or occurred in our institution from 1955 to 1959, was thought worth while.

There has been much unnecessary confusion in the text-books and

literature regarding the definition and degree of prolapse of the umbilical cord. In our study only those cases, where the umbilical cord was seen or felt below the lower pole of the foetus, after rupture of the membranes, have been included.

## *Material*

Out of 37,555 viable confinements in our institution from 1955 through 1959, prolapse of the umbilical cord occurred in 111 cases, giving an incidence of 1 in 338 or .3 per cent. Higher incidence has been reported by Chassar Moir (1956) and Myles (1959) and similar incidence has been observed by Dilworth and Ward (1957) and Fenton and D'Esopo (1951).

TABLE I  
*Incidence of Prolapse of Umbilical Cord*

Author	No. of delivery	No. of prolapse of cord	Incidence percentage
Fenton and D'Esopo (1951) ..	60,788	216	.35
Rhodes (1956) ..	15,355	83	.54
Slate and Randall (1956) ..	15,578	63	.4
Chassar Moir (1956) ..	—	—	.67
Dilworth and Ward (1957) ..	19,893	66	.33
Myles (1959) ..	26,915	165	.61
Present series. ..	37,555	111	.3

### *Etiology and Predisposing Factors*

If the presenting foetal pole is not properly adapted to the lower uterine segment and the pelvic inlet, the umbilical cord is likely to prolapse when the membranes rupture. Conditions that produce such maladaptation of the presenting part are generally presumed to be the etiological or predisposing factors of this complication. There may be other contributing factors, such as proximity of the umbilical cord to the cervix, as in low implantation of the placenta and abnormally long cord. More than one incriminating factors may be present in many cases.

### *Parity*

Fenton and D'Esopo (1951) did not find parity playing any part in the etiology of the prolapse of the umbilical cord. As reported by Bourgeois (1941), incidence of cord prolapse in primigravidas and multigravidas was 0.41 per cent and 0.43 per cent respectively. At least in his study multiparity was not proved to be an incriminating factor. According to Chassar Moir (1956), though this complication is met with 5 times more often in multigravidas than in primigravidas, that is due to more multigravida confinements and parity plays no important part in the etiology.

In the present study, out of 37,555 viable confinements during the period under review, 71 per cent were multigravidas and 29 per cent were primigravidas. Out of 111 cases of prolapse of the umbilical cord, this occurred only 14 times in primigravidas (12.6 per cent) and 97 times in multigravidas (87.4 per cent); so the incidence of cord prolapse in the

multigravidas was disproportionately higher.

The actual incidence of prolapse of the umbilical cord in the multigravidas (0.37 per cent) has been found to be three times higher than that in the primigravidas (0.13 per cent). Maximum incidence of the prolapse of the umbilical cord (21 per cent) according to individual parity has been found in the grande multigravidas (para 5 and above). Rhodes (1956) also found increasing parity as a predisposing factor. Importance of parity as an etiological or predisposing factor has also been stressed by Slate and Randall (1956), who found the complication nearly twice as common (0.41 per cent) in multigravidas as in primigravidas (0.25 per cent). Myles (1959) also had similar experience. There had been 11 grande multigravidas in the present series, in each of whom the presenting part was vertex where no other possible or probable factors were present excepting the high presenting part. Late engagement of the presenting head due to laxity of the abdominal wall and uterine musculature may be reasonably presumed to be the responsible factor in such cases. Further, multiparity is more associated with other complications, such as abnormal presentations and placenta praevia, which predispose to prolapse of the umbilical cord.

### *Malpresentation*

Malpresentation is probably the most important predisposing or etiological factor for this complication, to which all authors agree.

Nearly 50 per cent of the cases in the present series were associated



TABLE II  
*Presentation*

Presentation	Average per cent presentation at Chittaranjan Seva Sadan during the period under review	Per cent presentation in prolapsed cords	Gross foetal mortality per cent
Vertex ..	95.9	49.6	60
Breech ..	3.1	15.3	64.7
Transverse ..	.6	25.2	85.7
Face and brow ..	.3	1.8	50
Compound ..	.1	8.1	88.9

with malpresentation or compound presentation. As the percentage incidence of various presentations in association with prolapse of the umbilical cord is compared with the incidence of different presentations as a whole (Table II), it becomes evident that disproportionately larger number of cases of breech, shoulder and face-brow presentations are associated with this complication.

Kurzrock, as quoted by Myles (1959), found that out of 100 cases of prolapse of the umbilical cord, 59 were associated with vertex presentation, 23 with breech presentation and 18 with transverse lie.

Malpresentation was present in 57.6 per cent of cases of Fenton and D'Esopo (1951).

Maximum number of cases of prolapse of the umbilical cord are always associated with vertex presentation, because vertex presentation is so extremely common (Table II). The actual risk of this complication in dif-

ferent presentations is shown in Table III.

All the authors agree that the risk is maximum in shoulder presentation and least in vertex.

#### *Prematurity*

Prematurity is rightly adjudged to be another important etiological factor. Due to frequent association of malpresentation with prematurity and inadequate filling of the pelvis by the small presenting part, chances of prolapse of the umbilical cord are much increased.

Our incidence of prematurity was 24 per cent. It was 25 per cent with both Rhodes (1956) and Cope (1951), 28.6 per cent with Slate and Randall (1956), 29 per cent with Myles (1959), and 34.8 per cent with Dilworth and Ward (1957).

#### *Placenta Praevia*

Low implantation of the placenta is rightly considered to be another

TABLE III  
*Per cent Incidence of Prolapsed Cord in Different Presentations*

Authors	Vertex	Breech	Shoulder
Mengert & Longwell (1940) .. ..	0.37	4.5	14.27
Chassar Moir (1956) .. ..	—	5.0	15-20
Slate & Randall (1956) .. ..	0.24	2.3	14.6
Present series .. ..	0.15	1.3	12.4

important contributing factor.

Placenta praevia was associated with 10 cases in our series, i.e. an incidence of 9.1 per cent.

Myles (1959) found placenta praevia in 12.1 per cent of his cases, Dilworth and Ward (1957) in 6 per cent and Rhodes (1956) in 5.4 per cent.

#### *Multiple Pregnancy*

Multiple pregnancy is expected to increase the risk of prolapsed cord as the presenting parts are small, engagement is delayed and also abnormal presentation is frequent.

We had only 3 such cases, an incidence of 2.7 per cent. Our incidence is much lower in comparison to figures presented by other authors. It was 9 per cent with Rhodes (1956) and Dilworth and Ward (1957), 10 per cent with Fenton and D'Esopo (1951) and 15.8 per cent with Myles (1959).

#### *Contracted Pelvis or Cephalopelvic Disproportion*

Pelvic abnormality or cephalopelvic disproportion was thought to be present in only 3 cases, i.e. an incidence of 2.7 per cent; of these 3 cases, only one was labelled as flat pelvis. So this does not seem to play any important part in the etiology of prolapse of the umbilical cord in the present series. This is not in agreement with other authors.

Myles (1959) had 17 cases of abnormal bony pelvis, an incidence of 10.3 per cent. Out of them, 11 cases were found to be cases of flat pelvis and the remaining 6 were of the generally contracted type. Disproportion was thought to be present in 16 per cent of cases in the series present-

ed by Rhodes (1956). According to Fenton and D'Esopo (1951), variations in the size and shape of the pelvis as such did not seem to be related to the etiology of this complication. They did not find any disproportionately high incidence of any particular type of pelvis in their series, when compared to the average distribution of various types of pelvis.

Slate and Randall (1956), on the other hand, noted much lower incidence of associated contracted pelvis in their series, which was 4.8 per cent. There was only 1 case of inlet contraction out of 58 cases of Mengert and Longwell (1940) and 3 cases of funnel pelvis. Funnel pelvis, they thought, was probably not involved in the etiology of prolapsed cord.

#### *Hydramnios*

A sudden gush of excessive liquor may force out the loop of cord if the presenting part be free. But in the experience of the present authors, who had only 1 case of hydramnios, this does not seem to play any part in the causation of the complication of prolapsed cord. This experience is also shared by Cope (1951) who had only 2 cases in his series of 338 cases. Dilworth and Ward (1957) had also only one case of hydramnios out of 66. On the other hand, Myles (1959) has reported an incidence of hydramnios in 8.6 per cent in his series and it was 5 per cent with Fenton and D'Esopo (1951).

#### *Long Cord*

Abnormally long umbilical cord has been blamed as a factor predisposing prolapse. This has not been substantiated by most of the published



facts and figures. The experience of the present authors is also similar. There was no case in the present series where the cord was longer than 75 cm. Average length of 55 measured prolapsed cord, in the series of Mengert and Longwell (1940) was 73 cm. and it was 69.9 cm. as found by Cope (1951). Myles (1959) had only 4 cases out of 165, where the length of the cord was over 75 cm.

But cords were long in 2.5 per cent of the cases, as reported by Fenton and D'Esopo (1951).

We agree with Myles (1959) that long cord is not an important etiological factor. If it is unusually long, there is more chance of its protruding out of the vulva, once it has prolapsed.

#### *Obstetrical Manipulations*

Manual rotation of the head after displacement above the brim and artificial rupture of the membranes, specially low rupture, may cause or predispose to prolapse of the umbilical cord. But there was no such case in the present series.

Twenty per cent of the cases, as reported by Rhodes (1956), occurred after surgical induction of labour. But, this includes induction by Krause's bougies in many cases and, further, the type of rupture of the membranes has not been mentioned. Fifteen per cent of the cases reported by Fenton and D'Esopo (1951) occurred after either artificial rupture of the membranes with unengaged presenting part or attempt at manual rotation after elevation of the head above the pelvic brim.

That prolapse of the umbilical cord after low amniotomy is not as com-

mon as might be expected is borne out by Bruce Eaton (1959) who had only 1 case of prolapsed cord out of 500 cases of low amniotomy.

#### *Foetal Prognosis*

The overall foetal mortality in large maternity centres has been assumed to be near about 50 to 60 per cent (Chassar Moir, 1956).

There had been 77 foetal deaths in the present series, including 6 neonatal deaths, out of 111 cases, i.e. an incidence of 69.4 per cent. That is rather high in comparison to other published figures.

Prolapse of the umbilical cord was associated with 2.4 per cent of perinatal deaths in our hospital during the 5 year period under review.

TABLE IV  
*Foetal Prognosis*

Authors	Gross foetal mortality per cent
Fenton & D'Esopo (1951)	37.5
Slate & Randall (1956) ..	42.8
Rhodes (1956) ..	36.4
Dilworth & Ward (1957)	31.8
Myles (1959) .. ..	36.4
Present series .. ..	69.4

Out of 77 foetal deaths, 45 babies were dead on admission or diagnosis, leaving 66 cases only, where foetal salvage was possible. The uncorrected foetal mortality in the salvageable cases was 48.5 per cent.

The very unfavourable foetal prognosis in face of this complication, is due to several factors which have been analysed.

#### *Parity*

Mengert and Longwell (1940) found that the foetal mortality in the

primigravidas was almost twice that in the multigravidas.

No appreciable difference in the overall foetal loss in the primigravidas (71.4 per cent) and in the multigravidas (69 per cent) has been observed in the present study. In the treatable cases, on the other hand, foetal loss has been somewhat higher in the multigravidas (Table V). Fenton and D'Esopo (1951) and Myles (1959) also had higher foetal loss in the multigravidas.

to previous belief does not seem to affect the foetal prognosis any more adversely than multiparity.

*Presentation*

As in the etiology, presentation also plays an equally important role in the prognosis.

Thirty-one out of 60 gross foetal deaths, as reported by Myles (1959), occurred in cephalic presentation. Slate and Randall also found like Myles (1959) that foetal mortality in

TABLE V  
*Foetal Prognosis and Parity*

Authors	Foetal loss per cent	
	Primigravidas	Multigravidas
Fenton and D'Esopo (1959) ..	29.2	38.1
Slate and Randall (1956) ..	40.0	43.7
Myles (1959) .. ..	24.5	31.3
Present series .. ..	42.9	49.2

TABLE VI  
*Foetal Mortality and Presentation*

Presentations	Total no. of cases	No. of deaths	Foetal mortality per cent	No. of salvageable cases	No. of death	Foetal mortality per cent
Vertex	55	33	60.0	39	17	43.6
Breech	17	11	64.7	9	3	33.3
Shoulder	28	24	85.7	10	6	60.0
Compound	9	8	88.9	7	6	85.7
Face and brow	2	1	50.0	1	0	nil

According to Myles (1959), lower foetal mortality in the primigravidas is partly due to extended use of Caesarean section. Caesarean section had been performed in his series twice as frequently in the primigravidas as in the multigravidas. Foetal result was better in the primigravidas in the present series, even though none of them was delivered by Caesarean section.

It seems that primiparity contrary

vertex presentation (35.3 per cent) was higher than that in breech (23.1 per cent) but lower than that in shoulder presentation (57.2 per cent).

Our observations are somewhat different.

Overall foetal mortality has been slightly higher in breech presentation than that in vertex. But in the salvageable cases, much greater foetal loss has been recorded in vertex pre-



TABLE VIII  
Method of Delivery and Foetal Prognosis

Methods of delivery	After full dilatation				Before full dilatation				Total foetal loss per cent
	No. of cases	No. of S. B.	No. of N. D.	Foetal loss per cent	No. of cases	No. of S. B.	No. of N. D.	Foetal loss per cent	
Spontaneous .. ..	8	2	1	37.5	5	3	0	60	46.1
Internal podalic version and extraction .. ..	12	3	2	41.6	3	2	0	66.7	46.7
Reposition and spontaneous ..	2	0	0	0	6	5	1	100	75
Reposition and forceps .. ..	0	0	0	0	1	1	0	100	100
Forceps .. ..	6	1	0	16.7	0	0	0	0	16.7
Internal podalic version .. ..	1	1	0	100	2	2	0	100	100
Breech extraction .. ..	5	1	1	40	1	0	0	0	33.3
Bipolar podalic version .. ..	0	0	0	0	2	2	0	100	100
Bringing down a leg .. ..	0	0	0	0	1	1	0	100	100
Caesarean section .. ..	1	1	0	100	10	1	1	20	27.3

S.B. = Still Birth.

N.D. = Neonatal Death.

is diagnosed or presents for treatment and the interval that elapses between occurrence of the complication and institution of the treatment. The last factor is most important.

The different methods of treatment with their results are tabulated in Table VIII. Although the number of cases under different methods of treatment is too small for the results to be statistically significant, it is clearly suggested that foetal prognosis is relatively better after forceps delivery or breech extraction or Caesarean section than any other methods. The result after reposition of the cord was highly disappointing.

Craniotomy was performed in 2 cases, both on after-coming heads; one after breech extraction and the other on a hydrocephalic baby. Manual dilatation was performed in one case before internal podalic version and breech extraction; the baby survived. Reposition of the cord and scalp traction were performed in one case, which was subsequently delivered by caesarean section of a living baby. Traction on the leg was ap-

plied in 2 cases after bipolar podalic version; in one case after reposition of the cord and in another case after internal podalic version.

Foetal prognosis was one and a half times better when the cervix was fully dilated than when it was not.

Fenton and D'Esopo (1951) also found much better foetal prognosis when the cervix was fully or almost fully dilated.

When the delivery was immediately undertaken by appropriate methods as soon as the cord prolapsed, when the patient was in the hospital or immediately after admission, foetal mortality was nearly half than that when the delivery was delayed.

Myles reported 62.9 per cent foetal mortality when the delivery was delayed, whereas only 18.6 per cent of the babies were lost when the delivery was immediately performed.

By immediate delivery of the baby by forceps or breech extraction, Rhodes (1956) had 70 per cent foetal survival, whereas only 30 per cent survived when the delivery was delayed.

TABLE IX  
*Dilatation of Cervix and Foetal Prognosis*

Condition of cervix	No. of cases	No. of live-birth	No. of still birth	No. of neonatal death	Foetal loss per cent
Fully dilated ..	35	26	9	4	37.1
Not fully dilated ..	31	14	17	2	61.2

TABLE X  
*Foetal Prognosis and Time of Delivery*

Time of delivery	No. of cases	No. of live-birth	No. of still birth	No. of neonatal death	Foetal loss per cent
Immediate ..	24	22	2	5	31.8
Delayed ..	42	18	24	1	59.5



No infant was lost by Cox (1951) when delivery was immediately performed.

Caesarean section needs special mention in the treatment of prolapse of the umbilical cord, as it is the only safe method of immediate delivery when the cervix is not fully dilated and immediate delivery gives best chance of survival to the baby.

The use of Caesarean section has been greatly extended in the last two decades. It was performed in only one case out of 58 as reported by Mengert and Longwell (1940) and in 4 cases out of 155 in Bourgeois (1941) series. In some recent reports, as that of Dilworth and Ward (1957) and Myles (1959), Caesarean section has been performed in nearly 50 per cent and 22 per cent of the salvageable cases respectively with very satisfactory foetal survival.

In the present series, Caesarean section was performed in 11 cases out of 66 salvageable cases (16.6 per cent). In only 1 case the cervix was fully dilated and the section was performed for disproportion. When the cervix was not yet fully dilated, section was performed in 1 case for severe degree of placenta praevia with transverse lie, though the baby was grossly premature. Three babies were lost including that of the case of placenta praevia, 2 being still-born and the other died neonatally. Thus uncorrected foetal loss after Caesarean section was 27.3 per cent, whereas foetal mortality after vaginal delivery in salvageable cases was nearly twice (52.7 per cent). When only 20 per cent of the babies died after Caesarean section, 81 per cent of the babies were lost after vaginal delivery by any method, the cervix being in-

completely dilated when treatment could be instituted. Rhodes (1956) lost 90 per cent of the babies under similar circumstances. Five cases of incompletely dilated cervix in his series were treated by Caesarean section, when no baby was lost.

Caesarean section was performed on 32 cases out of 148 salvageable cases in the series of Myles (1959), when only 2 babies were lost (foetal loss—6.2 per cent), whereas foetal mortality was 35.2 per cent in vaginal delivery cases.

Nearly 50 per cent of salvageable cases, 25 out of 54, of Dilworth and Ward (1957) had been treated by Caesarean section. The foetal mortality was 12 per cent. It was nearly double (21 per cent) in the vaginal delivery group.

Cope (1951) reported only 2 foetal deaths in 42 cases of incompletely dilated cervix treated by Caesarean section.

No maternal mortality has been reported by any of these authors after Caesarean section for prolapse of the umbilical cord, excepting by Cope (1951), who lost 1 mother out of his 42 Caesarean section cases.

Risk to the mother is little increased whereas probability of foetal survival is increased many times after Caesarean section for prolapse of the umbilical cord, where immediate vaginal delivery is not possible or safe.

#### *Comment*

Prolapse of the umbilical cord takes a heavy toll of foetal life. Good many of these babies can be saved by prevention, anticipation and early detection of the complication and last-



ly by prompt delivery by appropriate methods when the complication does occur.

Malpresentation and prematurity are the two most important etiological factors and they are preventable to a greater or lesser extent by proper antenatal supervision and cooperation of the patients.

The complication is to be anticipated in all cases where the abnormal presentation or lie persists or the presenting head remains high due to any reason. All such cases should report for admission into the hospital as soon as labour pains start or the membranes rupture, whichever is earlier. Occasionally, a case, such as a case of unstable lie, may have to be admitted a few weeks before the expected date of confinement.

An internal examination as soon as the membranes rupture in all cases, in absence of any contraindication, where the prolapse of the umbilical cord is anticipated or where there is unusual alteration in the rate and character of the foetal heart sounds will detect many cases of prolapse of the umbilical cord sufficiently early.

Asphyxia, birth injuries and prematurity are the chief causes of death. How long the baby can withstand pressure on the cord is a moot question. But if the baby is to be saved, it has to be delivered immediately. Reposition of the cord, Braxton-Hick's version and such other methods should be completely abandoned. If the cervix is completely dilated and the presenting part is low, vaginal delivery by appropriate method is to be undertaken. Where the conditions are not safe or suitable for immediate vaginal delivery, Caesarean section should be unhesi-

tatingly performed if the baby has a reasonable chance of survival.

Recent authors like Rhodes (1956) and Dilworth and Ward (1957) feel that Caesarean section should be performed in nearly all cases where the cervix is not fully dilated. The present authors also share the same view. The objection against extended use of Caesarean section is the increased risk of operating on a hurriedly prepared patient. The improved method of anaesthesia and post-operative care as also antibiotics and chemotherapeutic drugs should overcome this objection. It goes without saying that no extra risk on the mother should ever be taken if the chances of survival of the baby are not reasonably good.

Importance of adjunctive measures, while the preparation for Caesarean section is going on, has been stressed by Dilworth and Ward (1957). Replacement of the prolapsed cord in the vagina, relieving of pressure on the cord by manual elevation of the presenting part and postural treatment and oxygen inhalation to the mother will be of much help.

The importance of the state of dilatation of the cervix regarding the foetal prognosis has been much reduced due to the extended use of Caesarean section. Actually more babies were saved (88 per cent) by Dilworth and Ward (1956) where the cervix was incompletely dilated than when the dilatation was complete (79 per cent). This was because of the fact that 24 out of 25 cases of incomplete dilatation of the cervix were treated by Caesarean section.

Some neonatal deaths are liable to



occur due to intracranial injuries caused by rapid and traumatic deliveries. There had been disproportionately larger number of neonatal deaths in the present series (Table X) as well as in that of Dilworth and Ward (1957) in the immediate delivery group.

The danger is more if the baby is premature.

### Summary

One hundred and eleven cases of prolapse of the umbilical cord that occurred or were admitted over a five year period in the Chittaranjan Seva Sadan hospital have been reviewed.

Malpresentation, prematurity, multiple pregnancy, placenta praevia and multiparity are found to be important etiological or contributing factors.

The overall foetal loss was 69.4 per cent and uncorrected foetal mortality in salvageable cases was 48.5 per cent.

Many babies were lost as delivery was mostly delayed, where the cervix was incompletely dilated and use of Caesarean section was restricted.

The place of Caesarean section has been discussed and its extended use emphasized.

Some suggestions for reducing the incidence of prolapse of the umbilical cord and improving the foetal prognosis after it occurs have been made.

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### References

1. Bourgeois G. A.: *Am. J. Obst. & Gyn.*; 41, 837, 1941.
2. Chassar Moir J.: *Munro Kerr's Operative Obstetrics*; 6th Ed., 1956. Bailliere, Tindall and Cox, London.
3. Cope E.: *J. Obst. & Gyn. Brit. Emp.*; 58, 259, 1951.
4. Cox L. W.: *Lancet*; 1, 561, 1951.
5. Dilworth E. E. and Ward J. V.: *Am. J. Obst. & Gyn.*; 73, 1088, 1957.
6. Eaton B.: *J. Obst. & Gyn. Brit. Emp.*; 66, 462, 1959.
7. Fenton A. N. and D'Esopo D. A.: *Am. J. Obst. & Gyn.*; 62, 52, 1951.
8. Mengert W. F. and Longwell F. H.: *Am. J. Obst. & Gyn.*; 40, 79, 1940.
9. Myles T. J. M.: *J. Obst. & Gyn. Brit. Emp.*; 66, 30, 1959.
10. Rhodes P.: *Proc. Roy. Soc. Med.*, 49, 937, 1956.
11. Slate W. G. & Randall J. H.: *Am. J. Obst. & Gyn.*; 72, 991, 1956.