Incidental Perinatal Mortality in Prolapse of the Human Umbilical Cord*

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A COMPREHENSIVE clinical epidemiological survey of 264 consecutive cases of prolapse of the human umbilical cord, that had occurred amongst all births, delivered at the Aberdeen Maternity Hospital, Aberdeen, Scotland, United Kingdom, over the 10-year period from 1953 to 1962 inclusive, was undertaken. This study was a retrospective survey, undertaken during 1962-1963, towards the end of my tenure of postgraduate appointment at the above Institution (Sinnathuray, 1967).

During this 10 year period, there occurred 36,687 total births and 264 cord prolapse births in this Hospital, giving an incidence of 1 cord prolapse birth in 139 total births (0.7%) for this Hospital. Cord prolapse stillbirths accounted for 5.2% of all stillbirths, and cord prolapse 1st week neonatal deaths accounted for 2.6% of all 1st week neonatal deaths in this Hospital. The overall standards of obstetric care, in particular, perinatal obstetric care, at this Hospital have been and are one of the highest throughout the world, so that the perinatal salvage rates for most obstetric disorders are one of the best in the United Kingdom, if not in the world. This applies equally well for the condition of prolapse of the umbilical cord (Sinnathuray, 1967 and Table II).

It will be noted from Table I that out of 264 cord prolapse births, 202 remained alive beyond the first week of life, giving a perinatal cord prolapse survival rate of 76.5%. The Incidental Perinatal Deaths contributed to a significant 9.1% (24 cases)

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Table I

Overall Distributional Pattern of Cord Prolapse Cases

Case Pattern	No. of Cases	%
Incidental Perinatal Deaths	24	9.1%
Salvageable Perinatal Deaths due primarily to Asphyxia	22	8.4%
Salvageable Perinatal Deaths due primarily to Trauma	4	1.5%
Salvageable Perinatal Deaths due partly to Asphyxia and partly to Prematurity	12	4.5%
Surviving Cord Prolapse Births	202	76.5%
Total	264	100%

of all cord prolapse births in this Survey. A further 8.4% (22 cases) of cord prolapse births were Salvageable Perinatal Deaths due primarily to Asphyxia; 1.5% (4 cases) were Salvageable Perintal Deaths due primarily to Trauma; and the final 4.5% (12 cases) of cord prolapse births were Salvageable Perinatal Deaths due partly to Asphyxia and partly to Prematurity.

Table II presents the patterns of foetal mortality, as evidenced in this clinical survey. It is strikingly apparent that the 24 cases labelled as "Incidental Perinatal Deaths" had a 100% foetal mortality rate. The Corrected Salvageable Foetal Mortality Rate for this Survey was 15.8% (38 deaths out of 240 cases). Thus, the overall Gross Foetal Mortality Rate for this Survey was 23.5% (62 deaths out of

Table II
Overall Foetal Mortality Patterns

Patterns of Foetal Mortality	No. of Deaths	No. of Cases	Foetal Mortality Rate
Incidental Foetal Mortality Rate	24	24	100%
Corrected Salvageable Foetal Mortality Rate	38	240	15.8%
Gross Foetal Mortality Rate	62	264	23.5%
Corrected Treatable Foetal Mortality Rate for the Hospital (A.M.H.)	25	227	11.0%

264 cases). However, if the foetal mortality rate is ultimately corrected to exclude all the incidental perinatal deaths, as well as all those cases of cord prolapse, where the foetus was already dead on arrival at the doorstep of this Hospital, a further 13 cord prolapse foetal deaths would be excluded. This would give a Corrected Treatable Foetal Mortality Rate for this Hospital of only 11% (25 deaths out of 227 cases). This is an extremely low foetal mortality rate for this condition of cord prolapse.

Table III
Perinatal Mortality Distributional Pattern

Perinatal Mortality Pattern	No. of Deaths	%
Incidental Perinatal Deaths	24	38.7%
Asphyxial Perinatal Deaths	22	35.5%
Traumatic Perinatal Deaths	4	6.5%
Asphyxial/Prematurity Perinatal Deaths	12	19.3%
Total	62	100%

A breakdown distribution of the 62 perinatal deaths in this Survey (Table III), reveals the following pattern. The Incidental Perinatal Deaths (24 deaths) accounted for 38.7% of all the perinatal deaths, which is a significant proportion of all the perinatal deaths in this Survey. The Asphyxial Perinatal Deaths (22 deaths) accounted for 35.5% of all the deaths; the Traumatic Perinatal Deaths (4 deaths) accounted for 6.5% of all the perinatal deaths; and the Asphyxial/Prematurity Perinatal Deaths (12 deaths) accounted for the remaining 19.3% of all the perinatal deaths in this Clinical Survey.

Out of the 24 "Incidental" perinatal deaths, there were 6 deaths associated with gross foetal abnormalities incompatible with life, and the details of these foetal deaths are presented in Table IV. It will be noted that 3 of these are anencephalic foetuses, 2 are renal agenesis, and the last is a case of gross hydrocephalus with spina bifida.

It will be noted from Table V that 6 of the "Incidental" perinatal deaths in this Survey presented with gross degrees of maceration, which could have only arisen well before the onset of labour and before the occurrence of the cord prolapse. One of these cases was associated with severe rhesus immunisation, 2 with some form of chronic placental insuffciency, and in the remaining 3 of these macerated foetuses, the intra-uterine deaths (I.U.D.) remained unexplained, despite detailed clinical and autopsy studies.

It will be noted from Table VI that in 4 of these "Incidental" perinatal deaths, the foetuses were in a state of extreme foetal prematurity (less than 1500 gms. or 3 lbs. birth-weight, and below 34 weeks gestation). This state of extreme foetal prematurity and immaturity is incompatible with extra-uterine survival.

Table IV
Incidental Perintal Deaths (1)
Foetal Abnormalities Incompatible with Life

Case No.	Gestational Age	Birth-Weight		Pattern of Case
		Grammes	lbs. oza.	
1.	36 weeks	1,362	3 – 0	Anencephalus with Spina Bifida
2.	40 weeks	2,794.8	6 – 2½	Renal Agenesis
3.	39 weeks	3,049.5	6 – 11½	Gross Hydrocephalus with Spina Bifida
4.	34 weeks	1,645	4 – 10	Renal Agenesis
5.	41 weeks	1,816	4 – 0	Anencephalus
6.	38 weeks	2,028.3	4 – 7½	Anencephalus

Table V

Incidental Perinatal Deaths (2)

Grossly Macerated Foetuses

Case No.	Gestational Age	Birth-Weight			Pattern of Case
		Grammes	lbs.	ozs.	
1.	32 weeks	1,503.5	3	5	Unexplained I.U.D.
2.	40 weeks	1,589	3	8	Severe Chronic Placental Insufficiency
3.	38 weeks	2,127.3	4	11	Severe Rhesus Immunisation
4.	41 weeks	2,205.1	4	13¾	Unexplained I.U.D.
5.	39 weeks	2,043	4	8	Unexplained I.U.D.
6.	32 weeks	1,021.5	2	4	Severe P.E.T./Placental Insufficiency

Table VI

Incidental Perinatal Deaths (3)

Extreme Foetal Prematurity Incompatible with Life

Case No.	Gestational Age	Birth-Weight			Pattern of Case
		Grammes	lbs.	ozs.	
1.	30 weeks	1,347.9	2	15½	N.N.D. Lived for 2 days
2.	33 weeks	1,219.3	2	11	N.N.D. Lived for 9 hours
3.	32 weeks	1,127.3	2	7¾	1st Twin. Lived for 23 hours
4.	30 weeks	1,347.9	2	15½	2nd Twin. Fresh S.B. 1st Twin was macerated.

Table VII

Incidental Perinatal Deaths (4)
Other Incidental Perinatal Deaths

No.	Gestational Age	Birth-Weight			Pattern of Case
		Grammes	lbs.	ozs.	
1.	36 weeks	1,957.5	4	5	Concealed APH with 80% premature placental separation
2.	32 weeks	2,085.5	4	9½	Concealed APH with 40% premature placental separation
3.	32 weeks	2,000	4	6½	Placenta Praevia Type I with repeated bouts of APH.
4.	38 weeks	2,687.4	5	14¾	Gross Hudrops Foetalis (Rh Immunisation)
5.	34 weeks	3,091.9	6	13	Gross Hydrops Foetalis (Rh Immunisation)
6.	34 weeks	1,759.4	3	14	Oesophageal Atresia. Post-operative N.N.D.
7.	35 weeks	1,652	3	10¼	Oesophageal Atresia. Post-operative N.N.D.
8.	39 weeks	2,609.6	5	12	Purulent Meningitis and Severe Bronchopneumonia. 4th Day N.N.D.

Other Incidental Perinatal Deaths

In Table VII is presented the remaining groups of "Incidental" perinatal deaths seen in this Survey. There were 3 "Incidental" perinatal deaths that were associated were severe ante-partum haemorrhage, and the details of these 3 deaths are presented in the first section of this Table. In 2 "Incidental" perinatal deaths, the pregnancies were severely Rhesus immunised leading to gross hydrops foetalis which were incompatible with life, and the details are presented in the second section of this Table. Two further "Incidental" perinatal deaths followed post-operatively on the 2nd day, after major surgery for oesophageal atresia. The details of these 2 deaths are presented in the third section of this Table. The last "Incidental" perinatal death resulted from severe noenatal infection. The infant died on the fourth day of life from severe purulent meningitis and broncho-penumonia, as detailed in the last section of this Table.

Table VIII

Summary of Incidental Perinatal Deaths

Incidental Perinatal Mortality Pattern	No. of Deaths	%
Foetal Abnormalities Incompatible with Life	6	25%
Grossly Macerated Foetuses	6	25%
Extreme Foetal Prematurity Incompatible with Life	4	16.7%
Severe Ante-Partum Haemorrhage Incompatible with Foetal Survival	3	12.5%
Gross Hydrops Foetalis	2	8.3%
Major Post-Operative Neonatal Deaths	2	8.3%
Severe Neonatal Infection	1	4.2%
Total	24	100 %

Summary of Incidental Perinatal Deaths

In Table VIII is presented the summary of the "Incidental" perinatal deaths reviewed in this paper. It will be seen that "Foetal Abnormalities Incompatible with Life" (25%), "Grossly Macerated Foetuses" (25%), and "Extreme Foetal Prematurity Incompatible with Life" (16.7%), together, contributed towards two-thirds (66.7%) of all the "Incidental" perinatal deaths in this Survey.

The other 4 groups of "Incidental" perinatal deaths, which accounted for a total of one-third (33.3%) of all the "Incidental" perinatal deaths in this Survey (Table VIII), appear to be purely coincidental.

Comparative Studies

The term "Incidental", as applied to cord prolapse perinatal deaths, refers to those cases of cord prolapse perinatal deaths, where the occurrence of the prolapsed loop of the umbilical cord was purely coincidental and incidental, and had in no way contributed towards the perinatal death. It represents the non-salvageable component of the perinatal deaths in any series of cord prolapse births. The exclusion of these "Incidental" perinatal deaths is, therefore, an absolute correction factor in the computation of the "Corrected" Perinatal or Foetal Mortality Rate in all surveys of cord prolapse births.

Several workers, including Bowen (1949), Brandeberry and Kistner (1951), Kush (1953), Schultz (1955), Seligman (1960), Winchs and Claman (1961), and Kurtz and Munro (1962), have repeatedly shown, that "Foetal Abnormalities Incompatible with Life", "Grossly Macerated Foetuses", and "Extreme Foetal Prematurity Incompatible with Life" are the 3 common causes of "Incidental" perinatal deaths seen in association with cord prolapse births. In most of these studies reviewed, these 3 groups of "Incidental" perinatal deaths were responsible for more than 50% of the non-salvageable incidental perinatal deaths associated with cord prolapse births. It will be noted that, in this Study, these 3 groups of "Incidental" perinatal deaths, together, contributed towards two-thirds (66.7%) of all the "Incidental" perinatal deaths.

It is of interest to note that all these 3 causes have been commonly incriminated as predisposing factors towards the occurrence of cord prolapse. The operative mechanism is claimed to be "failure of the foetal presenting part to fit the pelvic brim snugly" or "foetal hypotension", either one or both of which could predispose towards the prolapse of the loop of the umbilical cord below the foetal presenting part.

Summary and Conclusions:

1. In a comprehensive clinical epidemiological survey of 264 consecutive cases of prolapse of the human umbilical cord, there occurred a total of 62 perinatal deaths, giving a gross perinatal mortality rate of 23.5%.

2. In 24 of these 62 perinatal deaths, the presence of a prolapsed loop of cord was purely **Incidental,** and was in no way contributory towards the deaths. These 24 **Incidental** perinatal deaths accounted for 9.1% of all cord prolapse cases and 38.7% of all the perinatal deaths in this clinical survey.

3. The 3 common types of **Incidental** perinatal deaths in this Survey were "Foetal Abnormalities Incompatible with Life" (25%), "Grossly Macerated Foetuses" (25%), and "Extreme Foetal Prematurity Incompatible with Life" (16.7%), and together they contributed towards two-thirds (66.7%) of all the "**Incidental**" perinatal deaths in this Survey. A similar pattern of findings was reported in many other studies. These represent the natural foetal wastage associated with prolapse of the human umbilical cord.

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