# POSSIBLE AVOIDABLE FACTORS IN THE PERINATAL MORTALITY ASSOCIATED WITH PLACENTA PRAEVIA

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Every obstetrician remembers instances where babies were lost in cases of placenta praevia owing to incorrect management. Either a conservative approach was persisted in for too long, or the pregnancy was terminated too soon. In other cases again unnecessary or even dangerous manipulative procedures were performed.

It was decided to review all cases of placenta praevia over a period of ten years with special reference to foetal survival. By a critical analysis of all perinatal deaths it was hoped that possible ways of improving the foetal results would be revealed.

Since the widespread adoption of the conservative principles advocated by Macafee there has been a dramatic fall in maternal mortality. The Obstetric Flying Squad, blood transfusion, and antibiotics, coupled with safer surgical techniques, have also played their parts in bringing about this improvement. The foetal results are less satisfactory, owing largely to the numbers of premature infants that are born despite efforts to prolong the pregnancy.

*Foetal salvage.* In 1939 Browne[1] recorded a perinatal mortality in placenta praevia of 54%. In the last series from Belfast the mortality rate had dropped to 11%;[8] Macafee has stated that the lowest possible figure would be about 5%. This represents the unavoidable foetal wastage due to prematurity. Yet many series published since 1954 from Great Britain, America and the Continent in fact show that a figure of 20% is difficult to reach (Table I).

TABLE I. PERINATAL MORTALITY IN PLACENTA PRAEVIA

| *Author* | *Year* | *Number of cases* | *Perinatal mortality* | *Incidence of caesarean section* |
|---|---|---|---|---|
| Westgren[11] .. | 1954 | 350 | 38% | 45% |
| Grant[4] .. .. | 1955 | 200 | 11·9% | 76% |
| Reich[9] .. .. | 1956 | 196* | 54·8% | 16·3% |
| | | 114† | 26·5% | 85·0% |
| Falke[2] .. .. | 1956 | 83 | 25·6% | 16·0% |
| Green[5] .. .. | 1959 | 242 | 12·6% | 81·0% |
| Kimbrough[7] .. | 1959 | 169 | 11·1% | 69·9% |
| Smith[10] .. .. | 1959 | 99 | 23·8% | 74·0% |
| Foote and Fraser[3] | 1960 | 120 | 12·5% | 60·0% |
| Hart[6] .. .. | 1962 | 36‡ | 50·0% | 55·0% |
| | | 34§ | 24·0% | 74·0% |
| Macafee[8] .. | 1962 | 206** | 14·9% | 68·4% |
| | | 219†† | 11·1% | 86·4% |
| Cape Town .. | 1963 | 402 | 22·3% | 72·0% |

*1919–40. †1941–54. ‡1949–54. §1955–60. **1945–52. ††1953–60.

## INVESTIGATION OF CASES AT PENINSULA MATERNITY HOSPITAL, CAPE TOWN

During the period 1 January 1953 to 31 December 1962 there were 403 cases of placenta praevia at the Peninsula Maternity Hospital, Cape Town. The maternal deaths numbered 2, or 0·5%. One of these two patients was sent to the hospital by ambulance and died minutes after arrival undelivered, from exsanguinating vaginal bleeding; the Flying Squad had not been summoned. This case will be excluded from the series.

The records of all the cases of placenta praevia where the baby was lost were reviewed. An assessment was made in each case of whether the baby could have been saved had the treatment been different, or conversely whether the treatment administered had been instrumental in causing the death of the infant. The following cases were therefore excluded from the survey:

(*a*) Where the foetal heart was not heard on admission.
(*b*) Where the birth weight was 3 lb. or under.
(*c*) Where the baby died in the neonatal period from causes unrelated to the method or the form of delivery, such as multiple congenital anomalies, or neonatal infections.
(*d*) Where the placenta praevia was incidental to the major cause of death.

Thus a division was made into 'unavoidable' and 'avoidable' cases. There is, of course, no doubt that most of the cases classed as 'unavoidable' were eminently avoidable. 58 (or 64%) of the babies lost were delivered from non-booked patients (Table III). Though the rest are classified as booked patients, many had attended the antenatal clinics only once or twice. In several cases the Flying Squad was not called and the patients were thus sent into hospital by ambulance without preliminary resuscitation. Many patients were multiparae with large families and were unwilling to enter or stay in hospital.

Each 'avoidable' case was then further analysed and the avoidable factors tabulated.

*Method of Delivery*

1. *Vaginal.* 111 patients (28%) were delivered vaginally; 43 infants were lost (a perinatal mortality of 39%), of whom 32 or 74% were stillborn and 11 or 26% died in the neonatal period.

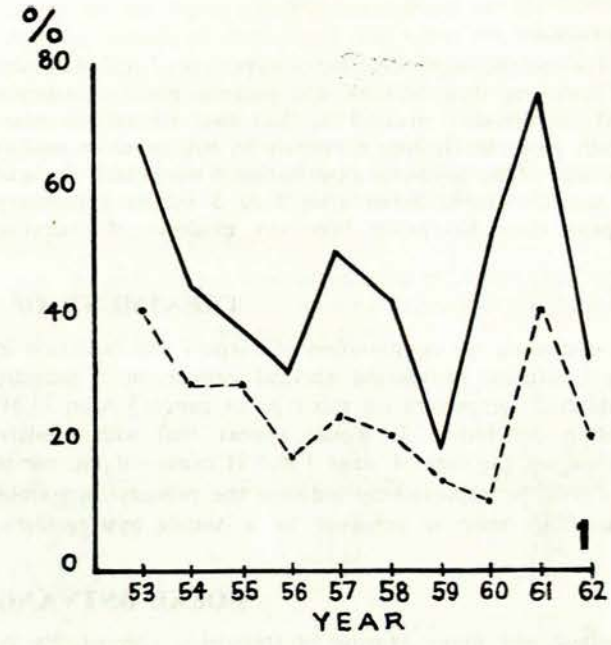


*Fig. 1.* Placenta praevia. Continuous line = percentage perinatal loss in vaginal deliveries. Dotted line = percentage perinatal loss in all deliveries.

2. *Caesarean section.* 291 patients (72%) were delivered by caesarean section; 46 infants were lost (a perinatal mortality rate of 16%), of whom 14 or 30% were stillborn and 32 or 70% died in the neonatal period.

The foetal loss in the perinatal period among the total 402 cases of placenta praevia was 22%.

Fig. 1 shows for each year in the period under review the high percentage foetal loss in placenta praevia cases delivered vaginally compared to the percentage loss in all placenta praevia cases, whether delivered vaginally or by caesarean section. Figs. 1 and 2 show the downward trend in the percentage of cases delivered vaginally and the interesting parallel

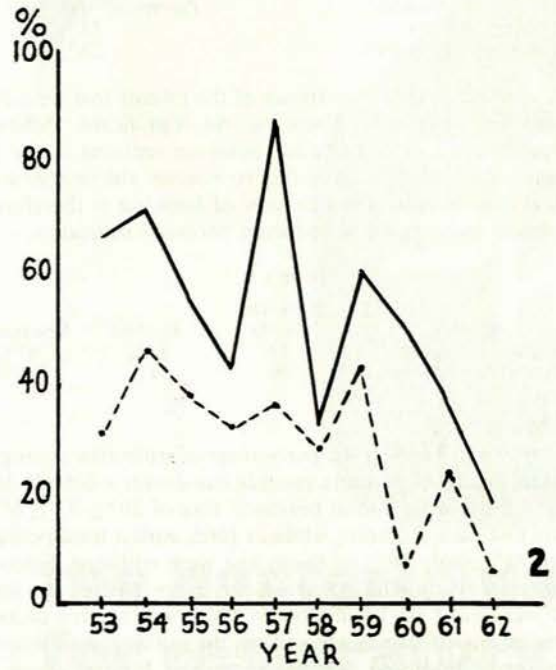


*Fig. 2.* Placenta praevia. Continuous line = stillbirths as percentage of the total perinatal loss. Dotted line = percentage of cases delivered vaginally.

drop in the percentage stillbirths, though the total percentage foetal loss is less significantly altered over the years.

A more critical analysis of the foetal loss associated with the two forms of delivery follows:

1. *Vaginal Deliveries* (111 cases; perinatal loss = 43)

A. '*Unavoidable*'

| | *No.* | | *Percentage of foetal loss* |
|---|---|---|---|
| Foetal heart not heard on admission .. | 22 cases | = | 51% |
| Birthweight 3 lb. or less .. .. .. | 6 cases | = | 14% |
| Gastroenteritis and other unrelated neonatal deaths .. .. .. .. | 4 cases | = | 9% |
| Placenta praevia incidental to severe accidental haemorrhage .. .. | 1 case | = | 2% |
| *Total* | 33 cases | = | 76% |

B. '*Avoidable*'. There were 10 cases (24% of the perinatal loss) where avoidable factors possibly leading to the loss of the baby were present.

1. Internal version and breech extraction (after the foetal heart had been heard at the commencement of the manipulation) resulted in 1 stillbirth and 1 neonatal death. Both cases had a type-2 placenta praevia. The birthweight of one was 4 lb. 15½ oz. The weight of the other was not recorded (the mother was 32-weeks pregnant).

2. In 1 patient examination under anaesthesia revealed a type-2 placenta praevia. The baby was thought to be too small for extra-uterine survival and therefore nothing further was done, and the patient was returned from the theatre to a ward. A few days later the foetal heart could not be heard, and labour was then induced by rupturing the membranes. The birthweight was 3 lb. 12½ oz.

3. In 2 patients examination under anaesthesia revealed respectively a type-1 and a type-2 placenta praevia. The membranes were ruptured in both cases and in the one patient a vulsellum was applied to the baby's scalp. This treatment resulted in one stillbirth and one neonatal death. The birthweights were 7 lb. 4 oz. and 3 lb. 15¾ oz.

4. In 2 patients examination under anaesthesia revealed a type-2 placenta praevia in both cases. In both the membranes were ruptured and a foot was brought down in one case after an internal podalic version. In both the foetal heart had been heard before these manoeuvres, yet the babies were stillborn. The birthweights were 4 lb. 12 oz. and 5 lb. 5½ oz.

5. In 1 patient the foetal heart was heard on admission to hospital. Three hours later the foetal heart rate decreased and it was decided to examine the patient under anaesthesia. A spontaneous vertex stillbirth occurred on the operating table. The type of placenta praevia was not recorded. The birthweight was 6 lb. 1½ oz.

6. In 2 cases the notes were incomplete. It is assumed that avoidable factors might have been present and therefore these two are included in this category. The first case was non-booked. A type-2 placenta praevia was present. The baby weighed 3 lb. 9¾ oz. and died 7 hours after delivery. The second case was booked. A type-1 or type-2 placenta praevia was felt. The baby was stillborn and weighed 7 lb. 7 oz.

2. *Caesarean Sections* (291 cases; perinatal loss = 46)

A. '*Unavoidable*'

| | *No.* | | *Percentage of foetal loss* |
|---|---|---|---|
| Foetal heart not heard on admission .. | 10 cases | = | 22% |
| Birthweight 3 lb. or less .. .. .. | 8 cases | = | 17% |
| Gastroenteritis and other unrelated neonatal deaths .. .. .. .. | 6 cases | = | 13% |
| Placenta praevia incidental to severe accidental haemorrhage .. .. | 3 cases | = | 6% |
| *Total* | 27 cases | = | 58% |

B. '*Avoidable*'. There were 19 cases (42% of the perinatal loss) where avoidable factors possibly leading to the loss of the baby were present.

1. In 3 patients a major factor seemed to be a difficult extraction of the baby at operation. In one case the section was performed because of a prolapsed arm. A type-2 placenta praevia was present. The baby weighed 4 lb., and died 49 hours after birth. The second patient arrived in the hospital with a blood pressure of 60/40 mm.Hg. She received 9 pints of blood before being transferred to the operating theatre. Under anaesthesia a breech was palpable through a 2-fingers dilated, uneffaced os. A type-2 placenta praevia was detected. At operation difficulty was experienced with the delivery of the shoulders. The baby died after 2 days. Its birthweight was 6 lb. 1½ oz. The third case was a transverse lie, with a type-4 placenta praevia. The birthweight was 5 lb. 13 oz., and the baby died 17 hours after delivery. Only one of these patients was booked.

2. In 4 patients massive vaginal bleeding preceding examination under anaesthesia had caused severe shock. One of these cases had been admitted 2 weeks previously with a diagnosis of placenta praevia. The diagnosis had been made by the patient's own doctor, who had examined her vaginally in her home. While in bed in hospital she suddenly lost 4 pints of blood *per vaginam*. After resuscitation she was examined under anaesthesia in the operating theatre and a type-4 placenta praevia was felt through a 2-fingers dilated os. Caesarean section was performed. The infant was stillborn. The state of the foetal heart at that time was not recorded. The birthweight was 5 lb. 3 oz. The other 3 patients were all brought to the hospital by ambulance, without the Flying Squad having been called, and therefore without any preceding resuscitation. All 3 had type-3 placenta praevias felt on examination in the theatre.

Two of the babies were stillborn (birthweights 3 lb. 11½ oz. and 6 lb. 15½ oz.), and the third baby (birthweight 3 lb. 5¾ oz.) lived for 9 hours. Two of the cases were booked.

3. In 4 cases the babies were premature, were born with a low Apgar rating, and grunted from birth. In 2 of these cases the mothers had been examined under anaesthesia. In 2 there was a type-3 placenta praevia and in 2 a type-4. The birthweights were 3 lb. 5¼ oz., 3 lb. 3½ oz., 4 lb. 15 oz., and 4 lb. 11 oz. All 4 babies died within 48 hours of birth. Two of the mothers were booked patients.

4. In 1 case a delay of 3 hours between the final heavy vaginal bleed and the performance of the caesarean section appeared to be the avoidable factor. There was a type-4 placenta praevia. The birthweight was 4 lb. 10 oz., and the baby died 4½ hours after birth. The mother was a booked patient.

5. In 1 case the mother had a sudden vaginal haemorrhage of about 4 pints. She was a gravida-14, para-8. She was examined under anaesthesia in the operating theatre and a type-3 placenta praevia was felt. The examination resulted in brisk bleeding. The lie of the infant was not recorded. The birthweight was 3 lb. 5½ oz., and the baby died within 24 hours. The mother was a non-booked patient.

6. In 6 cases the notes were incomplete, but for the same reasons as mentioned for the vaginal deliveries they are included among the 'avoidable' deaths. One baby was stillborn, the other 5 died within 24 hours of caesarean section. The type of placenta praevia was either 3 or 4. The birthweights were 3 lb. 5 oz., 4 lb. 1 oz., 3 lb. 4 oz., 4 lb. 1 oz., and in 2 cases not recorded. Two of the mothers were booked patients.

A summary of all the 'avoidable' perinatal deaths is included in Table II.

TABLE II. SUMMARY OF 'AVOIDABLE' PERINATAL DEATHS

| *No.* | *B\|N* | *birthweight* | *SB\|D* | *Type of placenta praevia* | *PV\|CS* | *Possible avoidable factor causing foetal death* |
|---|---|---|---|---|---|---|
| 1 | N | 4, 15½ | SB | 2 | PV | Internal version and breech extraction |
| 2 | B | ? | D | 2 | PV | Internal version and breech extraction |
| 3 | N | 3, 12½ | SB | 2 | PV | EUA. Left alone |
| 4 | B | 7, 4 | SB | 1 | PV | EUA. ARM |
| 5 | N | 3, 15¾ | D | 2 | PV | EUA. ARM Vulsellum |
| 6 | B | 5, 15½ | SB | 2 | PV | EUA. ARM. Podalic version |
| 7 | N | 4, 12 | SB | 2 | PV | EUA. ARM. Foot brought down |
| 8 | N | 6, 1½ | SB | ? | PV | EUA. Delay |
| 9 | N | 3, 9¾ | D | 2 | PV | EUA. Incomplete notes |
| 10 | B | 7, 7 | SB | 1-2 | PV | EUA. Incomplete notes |
| 11 | B | 4, 0 | D | 2 | CS | Diffic. extraction. Transverse lie |
| 12 | N | 6, 1½ | D | 2 | CS | EUA. Diffic. extraction |
| 13 | N | 5, 13 | D | 4 | CS | Diffic. extraction. Transverse lie |
| 14 | N | 3, 5¾ | D | 3 | CS | EUA. Shocked |
| 15 | B | 3, 11½ | SB | 3 | CS | EUA. Shocked |
| 16 | N | 6, 15½ | SB | 3 | CS | EUA. Shocked |
| 17 | B | 5, 3 | SB | 4 | CS | EUA. Shocked |
| 18 | B | 3, 5½ | D | 4 | CS | Prem. Low Apgar. Grunting |
| 19 | N | 3, 3½ | D | 3 | CS | Prem. Low Apgar. Grunting |
| 20 | B | 4, 15 | D | 4 | CS | Prem. Low Apgar. Grunting |
| 21 | N | 4, 11 | D | 3 | CS | Prem. Low Apgar. Grunting |
| 22 | B | 4, 10 | D | 4 | CS | Delay |
| 23 | N | 3, 5½ | D | 3 | CS | EUA unnecessarily |
| 24 | B | 3, 5 | D | 4 | CS | Incomplete notes |
| 25 | N | ? | D | 3 | CS | Incomplete notes |
| 26 | N | 4, 1 | D | 3 | CS | Incomplete notes |
| 27 | N | ? | SB | ? | CS | Incomplete notes |
| 28 | N | 3, 4 | D | 4 | CS | Incomplete notes |
| 29 | B | 4, 1 | D | 3 | CS | Incomplete notes |

B = Booked. N = Non-booked. SB = Stillbirth. D = Neonatal death. PV = Vaginal delivery. CS = Caesarean section. EUA = Examination under anaesthesia. ARM = Artificial rupture of the membranes.

## ANALYSIS

Several points of interest arise from this critical retrospective analysis:

1. *Booked and Non-booked Cases*

Of the total cases of placenta praevia, 45% were booked patients and 55% non-booked. However, 64% of the babies lost were from non-booked mothers. The percentage of non-booked patients in the 'avoidable' group was 58% (Table III). Of the non-booked patients 26% lost their babies,

TABLE III

| *Number* | *Booked* | *Non-booked* |
|---|---|---|
| 402 cases of placenta praevia .. .. | 45% | 55% |
| 89 perinatal deaths .. .. .. | 36% | 64% |
| 29 'avoidable' deaths .. .. .. | 42% | 58% |

as against 18% in the booked group (Table IV). Table V shows the breakdown into booked and non-booked cases according to the mode of delivery of the perinatal deaths.

TABLE IV

| *Number* | *Percentage perinatal loss* |
|---|---|
| 180 booked patients .. .. .. | 18% |
| 222 non-booked patients .. .. | 26% |

Thus a little less than two-thirds of the infants lost were from non-booked mothers. There is no significant difference between vaginal deliveries and caesarean sections in the percentages of infants lost according to whether the mother was a booked case or not. The question of booking is therefore of the utmost importance in reducing perinatal mortality.

TABLE V

| *Number* | *Perinatal deaths* | *Booked* | *Non-booked* |
|---|---|---|---|
| 109 vaginal deliveries .. | 43 | 33% | 67% |
| 293 caesarean sections .. | 46 | 39% | 61% |

2. *Stillbirths*

As shown in Table II the percentage of stillbirths among the perinatal deaths in placenta praevia has shown a definite drop. Thus in 1954, with a total perinatal loss of 29%, 72% of the infants lost were stillborn, while in 1962, with a total perinatal loss of 21%, only 18% of those lost were stillborn. Since the majority of stillbirths occurred in cases where no foetal heart was heard on admission to the hospital, this decrease can mean one of two things: either the initial resuscitation at the patient's home as performed by the Flying Squad has become more vigorous and prompt, or more mothers are being referred to hospital with their first and usually less severe episode of haemorrhage. The more frequent calls for the Flying Squad, the ready and ample supply of blood carried in the Squad car, and the avoidance of vaginal examinations by general practitioners and midwives, undoubtedly have played a big part in the drop in both the total stillbirths and the stillbirth rate associated with placenta praevia.

However, the fall in the total number and the percentage of stillbirths is not by any means due entirely to better management before admission to hospital. Equally the combination of expectant treatment in hospital, with frequent blood transfusions as small vaginal haemorrhages occur and energetic surgical intervention when the time has come to terminate the pregnancy, has played a major role. Macafee and many other authors have stressed these points before.

An important factor associated with foetal loss in the present series has been the vaginal examination in the theatre before caesarean section. There seems little doubt that in several cases this manoeuvre has caused or at least largely contributed to the death of the foetus. Where bleeding is severe or the baby premature the delay associated with a vaginal examination under anaesthesia and the attendant risk of a further haemorrhage may prove lethal. In the 29 'avoid-

able' deaths an apparently unnecessary vaginal examination under anaesthesia was performed in 7 cases, and possibly also in another 4.

The increasing use of caesarean section in placenta praevia is another well-documented reason for the decrease in the total number and percentage of stillbirths. Conversely the percentage of neonatal deaths will rise; but the large number of neonatal deaths needs further explanation.

*3. Perinatal Deaths*

What then is the cause of the high neonatal death rate in placenta praevia? Table VI shows the numbers of perinatal deaths according to birthweight and mode of delivery, further divided into booked and non-booked cases. Only 83 babies (including one set of twins) had their birthweights recorded.

TABLE VI

| *Birthweight* | *Less than 3 lb.* | | 3-3½ *lb.* | | 3½-4 *lb.* | | 4-4½ *lb.* | | 4½-5 *lb.* | | 5-5½ *lb.* | | *More than 5½ lb.* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | N | B | N | B | N | B | N | B | N | B | N | B | N |
| *Total deliv.* .. | 8 | 9 | 3 | 8 | 2 | 7 | 4 | 2 | 4 | 5 | 4 | 6 | 5 | 16 |
| *Vag. deliv.* .. | 5 | 4 | 1 | 2 | 0 | 7 | 1 | 1 | 1 | 4 | 1 | 3 | 5 | 6 |
| *Total deliv.* .. | 17 | | 11 | | 9 | | 6 | | 9 | | 10 | | 21 | |
| *Vag. deliv.* .. | 9 | | 3 | | 7 | | 2 | | 5 | | 4 | | 11 | |

75% of the perinatal deaths weighed 5½ lb. or less at birth.
76% of the perinatal deaths weighing over 5½ lb. were non-booked.
60% of the perinatal deaths weighing 5½ lb. or less were non-booked.

*4. Type of Placenta Praevia*

Table VII shows the type of placenta praevia present in the 84 mothers of children who died perinatally in whose cases this information was available. In this series very few cases of

TABLE VII

| | *Type 1* | *Type 2* | *Type 3* | *Type 4* |
|---|---|---|---|---|
| Number of perinatal deaths .. | 5 | 27 | 29 | 23 |

type-1 placenta praevia associated with perinatal loss were found. There were almost equal numbers of placenta praevia of types 2, 3 and 4 among the mothers whose infants did not survive.

Table VIII shows the mode of delivery of the perinatal death cases according to the type of placenta praevia, where

TABLE VIII

| *Type of placenta praevia* | *Vaginal delivery* | *Caesarean section* |
|---|---|---|
| 1 | 80% | 20% |
| 2 | 85% | 15% |
| 3 | 31% | 69% |
| 4 | 9% | 91% |

this information was available. The vast majority of perinatal deaths in type-1 and type-2 placenta praevia had been delivered vaginally, compared to less than one-third in type 3 and only 9% in type 4.

Table IX shows the percentages of stillbirths and neonatal deaths in the different types of placenta praevia, where this information was available. It is noted that in the lesser grades

TABLE IX

| *Type of placenta praevia* | *Stillbirths* | *Neonatal deaths* |
|---|---|---|
| 1 | 3 (60%) | 2 (40%) |
| 2 | 19 (70%) | 8 (30%) |
| 3 | 8 (29%) | 20 (71%) |
| 4 | 10 (43%) | 13 (57%) |

of placenta praevia, where vaginal delivery is common, there is a very significant number of stillbirths. Thus in type-1 and type-2 placenta praevia more than two-thirds of the infants lost were stillborn as against a little more than one-third in types 3 and 4. Table X shows that these infants are, if anything, less premature than those whose mothers have a more severe grade of placenta praevia.

Table X shows the birthweights of the babies lost according to the different types of placenta praevia, in the 77 cases where

TABLE X

| *Type of placenta praevia* | *Birthweight 5½ lb. or less* | *Birthweight over 5½ lb.* |
|---|---|---|
| 1 | 3 (75%) | 1 (25%) |
| 2 | 20 (74%) | 7 (26%) |
| 3 | 20 (80%) | 5 (20%) |
| 4 | 17 (81%) | 4 (19%) |

this information was available. Although few babies were lost associated with type-1 placenta praevia, the percentage of the infants born with a birthweight of 5½ lb. or less varied little in the four types.

## CONCLUSION

1. In assessing the 'avoidable' deaths a definite pattern is discernible in most of the cases:

(*a*) Nearly every one of these cases has been subjected to some manipulation, often unnecessary and sometimes dangerous. A large number were premature infants and the hypoxia consequent upon the maternal blood loss would affect them to a greater degree. In such cases it is to be expected that the additional burden of a manipulation or a lengthy period of anaesthesia might be lethal.

(*b*) In a small number of cases there seems to have been insufficient pre-delivery resuscitation of the mother. This is wholly preventable and should not happen in a hospital.

(*c*) Yet another group of babies died without any obviously detectable 'avoidable' factor. They probably fall into category (*a*) above.

(*d*) Two mothers lost their babies through inexcusable delay in delivering the infant. This again should not happen.

2. Where the diagnosis is certain the patient should not be subjected to a vaginal examination in the theatre, for fear of causing further severe bleeding. Similarly, where heavy vaginal haemorrhage demands urgent delivery and the baby is viable, a caesarean section without a preliminary vaginal examination should be performed.

Vaginal examination should be restricted to (*a*) the very doubtful case, (*b*) cases where moderate to profuse bleeding is not occurring, and (*c*) where the baby is either dead or has no reasonable chance of survival. In these instances a vaginal delivery is in the mother's best interests.

3. In most units caesarean section is the treatment of choice where the baby is alive or a major degree of placenta praevia is suspected. However, more and more patients with a type-1 or a type-2 placenta praevia are being delivered abdominally. Vaginal delivery is reserved for the dead baby with a minor degree of placenta praevia.

4. There is no unanimity about the type of caesarean section to be performed. Although a lower-segment caesarean section is usually done there are still indications left for a classical incision. This was shown in 3 of the cases in this series, where great difficulty with the delivery through a lower-segment incision was encountered.

5. As the baby is often premature and may be in a state of hypoxia, expert and safe anaesthesia is of the first importance. An expert in both foetal resuscitation and infant transfusion should be available to receive the baby at delivery.

SUMMARY

A review is given of 402 cases of placenta praevia delivered between 1953 and 1962. The foetal loss is analysed. An attempt is made to discover 'avoidable' factors leading to unnecessary deaths. The findings of the analysis are discussed.

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