THE INCIDENCE AND SIGNIFICANCE OF CLINICAL FOETAL DISTRESS IN LABOUR*

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SUMMARY

The results of a survey undertaken at Groote Schuur and Mowbray maternity hospitals into the incidence and significance of clinical foetal distress in labour are presented. The criteria for diagnosis of clinical foetal distress in labour are shown to be imprecise and it is concluded that any overt clinical sign of change of foetal equilibrium in labour must be regarded as potentially hazardous and call for further immediate management.

Foetal distress is shown to be associated with a significantly high perinatal mortality rate, and this appears to be irrespective of mode of delivery. A large proportion of the cases were associated with factors predisposing to foetal distress, such as accidental antepartum haemorrhage or pre-eclampsia. It is suggested that a policy of active observation of such cases in intensive care wards during labour is necessary to diagnose early foetal distress and hence to prevent the potentially salvageable stillbirths and neonatal deaths. Moreover, it is shown that special techniques such as foetal scalp blood sampling have little application at present until the high perinatal mortality rates associated with more common problems such as antepartum haemorrhage and prematurity are brought under control.

The demand for better means of assessing the state of the foetus *in utero* has resulted in the development of procedures such as continuous foetal heart rate monitoring, foetal electrocardiography and amnioscopy with foetal scalp blood sampling for acid-base and blood gas determinations. These methods serve not only to detect foetal anoxia or other disturbances but provide a guide to the state of the infant at birth.

While assessing the application of these new techniques it was considered necessary to determine their possible place in reducing perinatal mortality. Hence a prospective study into the incidence and significance of foetal distress was initiated. The value of such a study is manifold despite the fact that the clinical signs of foetal distress have long been known to be inadequate as a guide to the state of the foetus *in utero* and at delivery.[1] By defining the extent or incidence of foetal distress, the related obstetrical factors, perinatal mortality, accuracy of clinical diagnosis and possible preventable factors, such a study is of value in the planning of modern maternity services and in determining the possible impact that may be effected by the introduction of special diagnostic techniques. Aspects relating to paediatric care have been previously presented[2] and it is the purpose of this article to present those aspects which are of direct concern to the obstetrician.

METHODS

A prospective study of 1 256 deliveries was instituted at Groote Schuur and Mowbray Maternity Hospitals and covered the period April to July 1968. A standard form giving details of any abnormal medical or obstetrical

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features, the occurrence of foetal distress including diagnostic criteria, the level of the presenting part and the cervical dilatation at the time of diagnosis, the mode and outcome of delivery, and the birthweight, was completed by the midwife responsible for every delivery. Each form was checked against the obstetric case notes for accuracy and completeness. Cases of antepartum foetal death were excluded from the study.

All the cases were divided into one of two groups according to whether clinical foetal distress was diagnosed or not by the attending medical practitioner. The diagnosis of foetal distress was left to the medical practitioner present at the time. In every case this was based on changes in foetal heart rate or the presence of meconium-stained liquor amnii or a combination of the two.

The significance of the various diagnostic criteria was then analysed. The relationship of foetal distress to perinatal mortality, predisposing factors, mode of delivery, birthweight and 3-minute Apgar score was determined. An analysis of the level of the presenting part and the cervical dilatation at the time of diagnosis was also made.

RESULTS

The 1 256 deliveries comprised 510 White and 746 non-White patients. Apart from a statistically significant ($p = <0{\cdot}001$) higher prematurity rate in the non-White group, other racial differences were insignificant in relation to this study. The results presented are therefore for all races combined.

There were 117 cases of foetal distress diagnosed, giving an over-all incidence of 9·3%. There were 13 stillbirths and 6 neonatal deaths in the foetal distress group, whereas there were 28 stillbirths and 32 neonatal deaths in the group without foetal distress. The corresponding mortality rates with and without foetal distress are shown in Fig. 1. Both the neonatal death and stillbirth rates were significantly higher ($p = <0{\cdot}001$) in the foetal distress group.

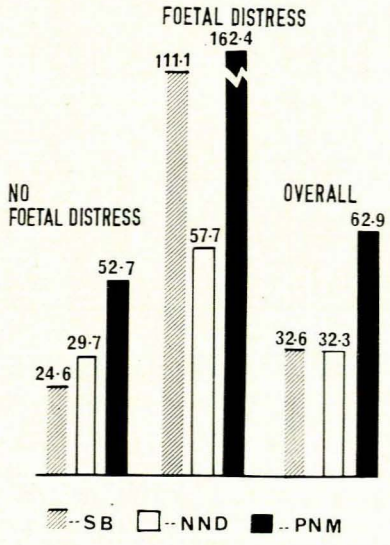

Fig. 1. Mortality rates per 1 000 with and without foetal distress.

All cases of foetal distress were subdivided according to the diagnostic criteria used by the attending medical practitioner during the labour as follows:

1. Meconium-stained liquor amnii only.
2. Foetal heart rate greater than 180/min or less than 100/min or irregular.
3. Meconium-stained liquor plus abnormal foetal heart rate as above.

The number and percentage of cases in each subgroup are shown in Fig. 2. The perinatal mortality in patients with foetal distress subdivided according to the criteria used for the diagnosis of foetal distress is shown in Table I.

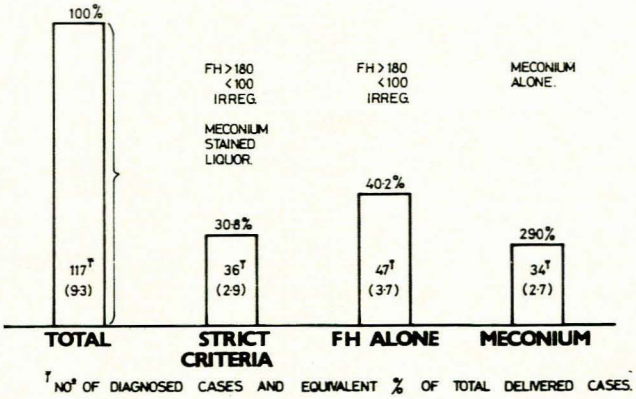

Fig. 2. Criteria for diagnosis.

TABLE I. MORTALITY RATES WITH FOETAL DISTRESS SUBDIVIDED ACCORDING TO DIAGNOSTIC CRITERIA

Diagnostic criteria	*Stillbirths/ 1 000 live births and stillbirths*	*Neonatal deaths/1 000 live births*	*Perinatal mortality/ 1 000 live births and stillbirths*
Abnormal foetal heart rate	170·2	51·3	212·8
Meconium	29·4	60·6	88·2
Foetal heart rate and meconium	111·1	62·5	166·6
Over-all	111·1	57·7	162·4

The results were unexpected in that the group with altered foetal heart rate plus meconium-stained liquor amnii accounted for a perinatal mortality rate of only 166·6 (31·6% of deaths due to foetal distress) as opposed to 212·8 (52·6% of deaths due to foetal distress) where alteration in the foetal heart was the only diagnostic sign. The perinatal mortality in the meconium group of 88·2 (15·8% of deaths due to foetal distress) was lower than in the other two groups but was nevertheless significantly greater than the perinatal mortality of 52·7 in the group without foetal distress. As all three groups showed a raised perinatal mortality it was decided to treat all the cases of foetal distress as one group for the purpose of analysis of other factors, such as mode of delivery, Apgar score and prematurity rates.

Additional factors predisposing to placental insufficiency, such as accidental antepartum haemorrhage and pre-eclampsia were present in more than half of all cases of perinatal mortality, irrespective of whether foetal distress was diagnosed or not.

The outstanding significant factor was accidental antepartum haemorrhage. This was present in 27 of the total

79 deaths in the series, 17 occurring in labour in the group not showing foetal distress. Other conditions, such as pre-eclampsia, diabetes mellitus, postmaturity and rhesus incompatibility were associated with foetal distress and perinatal mortality to a lesser extent.

The approximate point of labour at which foetal distress was diagnosed is shown in Table II, in which the cervical dilatation and level of presenting part at diagnosis is tabulated. Thus, about half the cases presented early in labour with the cervix 3 or less fingers dilated and the presenting part at or above the level of the ischial spines.

TABLE II. PROGRESS OF LABOUR AT DIAGNOSIS

	Cervical dilatation (fingerbreadths dilated)				
	1	*2*	*3*	*4*	*5*
No. of cases	7	30	18	25	37

	Level of presenting part		
	Above ischial spines	*At ischial spines*	*Below ischial spines*
No. of cases	41	17	59

TABLE III. RELATIONSHIP OF PERINATAL MORTALITY, STILLBIRTH AND NEONATAL DEATH RATES TO MODE OF DELIVERY, WITH AND WITHOUT FOETAL DISTRESS (RATE PER 1 000)

Death rate	*Mode of delivery*	*No foetal distress*	*Foetal distress*
Perinatal mortality	Spontaneous vaginal	43·8	179·0
	Forceps and vacuum	84·3	69·0
	Caesarean section	147·0	238·0
Stillbirths	Spontaneous vaginal	21·4	134·3
	Forceps and vacuum	24·1	0
	Caesarean section	73·5	190·4
Neonatal deaths	Spontaneous vaginal	22·9	51·7
	Forceps and vacuum	61·7	69·0
	Caesarean section	79·3	58·8

The relationship of perinatal mortality, stillbirth and neonatal death rates to the mode of delivery with and without foetal distress is shown in Table III. In cases without foetal distress there is a distinct relationship between mortality and mode of delivery. Thus, instrumental delivery demonstrates a greater risk to the infant than normal vaginal delivery. Caesarean section again has a greater mortality than instrumental delivery. However, where foetal distress has been diagnosed this relationship no longer appears to apply. That is, with foetal distress there is no apparent relationship between perinatal mortality, stillbirth and neonatal death rates and the mode of delivery.

The 3-minute Apgar score demonstrated a close correlation between low score and high neonatal death rate in the group with foetal distress (Fig. 3). There were no neonatal deaths following foetal distress in infants born with an Apgar score greater than 7/10. Alternatively, 5 of the 6 neonatal deaths following foetal distress were in infants born with an Apgar score of 3 or less. Furthermore, the group of infants ultimately surviving foetal distress demonstrated a close correlation with high Apgar score, nearly 80% having a 3-minute score of 7 or higher.

The incidence of prematurity and the relationship to foetal outcome is shown in Fig. 4 in which it is demonstrated that the majority of the perinatal deaths were associated with a birthweight of less than 2·5 kg. On the other hand, where the prematurity rate was low, the foetal outcome was relatively good. Only 2 of the 6 neonatal deaths following foetal distress were associated with prematurity. Further investigation of the 4 infants showed no evidence of congenital abnormalities, cerebral haemorrhage or other irreversible damage. In contrast, 75% of the infants dying after birth unassociated with foetal distress weighed less than 2·5 kg. The conclusion is that 4 of the 6 neonatal deaths following on foetal distress were potentially salvageable.

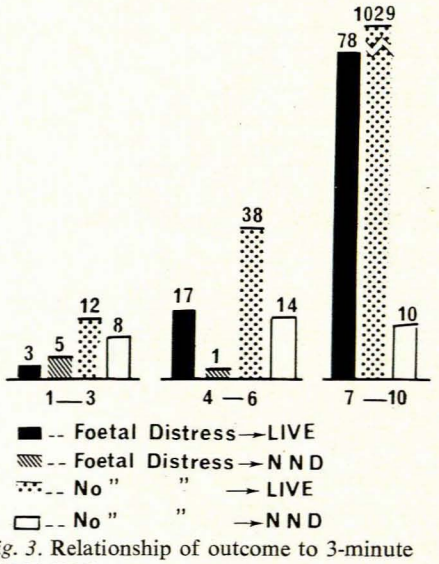

Fig. 3. Relationship of outcome to 3-minute Apgar score.

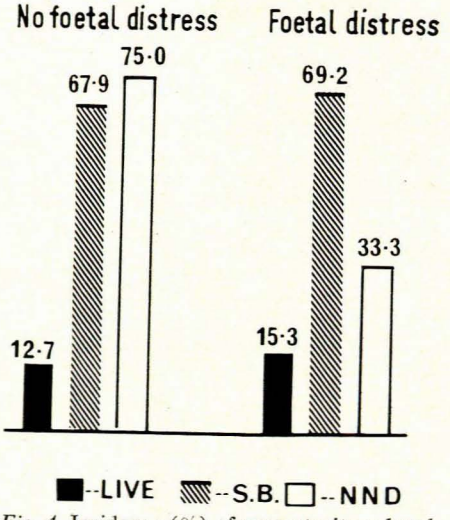

Fig. 4. Incidence (%) of prematurity related to foetal outcome.

DISCUSSION

Clinical foetal distress has been shown to be a significant contributor to perinatal mortality figures and the incidence of foetal distress of 9·3% in this study is similar to the 9·9% reported from Sloane Hospital for Women by

Fenton and Steer.[3] The clinical diagnosis is extremely difficult and the various diagnostic criteria have only an indirect relationship to foetal prognosis. Thus Benson *et al.*,[4] after a long and detailed clinical and computer study involving 24 863 labours, were unable to identify a definite prognostic value with changes in foetal heart rate, except possibly in extreme cases of bradycardia. The fact that the whole finding of meconium-stained liquor was associated with 15·8% of deaths in the foetal distress group was unexpected. Van Praagh and Tovell[5] have reported that the passage of meconium in the absence of foetal heart abnormality rarely represents severe foetal distress and Barham[6] has shown that the perinatal loss is 4·5% under these circumstances. The only conclusion to be drawn from such conflicting findings is that any overt clinical sign of change of foetal equilibrium must be regarded as potentially hazardous and call for further immediate investigation and treatment.

The presence of factors predisposing to placental insufficiency in over half of all the mortality reported in this series helps to define further the group of patients potentially at risk and requiring intensive observation during labour. The notable predisposing factor was accidental antepartum haemorrhage.

The approximate point of labour at which foetal distress was diagnosed was considered to be extremely important for the following reason: should the majority occur late in labour, prompt vaginal delivery is usually possible and the practical application of diagnostic tests such as foetal scalp blood sampling or foetal heart rate monitoring is minimal. On the other hand, foetal scalp blood sampling is extremely difficult early in labour, a time at which the decision as to performance of emergency caesarean section must be taken and a different diagnostic technique such as constant foetal heart rate monitoring may need to be employed. For example, the present study shows that approximately one-third of the cases of foetal distress were at a stage of labour where scalp blood sampling could materially have effected the outcome of labour. In figures this would amount to about 4% of all patients in labour. The decision as to whether such a number of cases warrants implementation of such a diagnostic test in any maternity unit is beyond the scope of the present article.

The results in general of the present investigation are in agreement with those presented by Farr.[7] She found in a retrospective study of the value of foe al scalp blood sampling in 2 638 booked patients that the perinatal mortality rate might be reduced from 15·9 to 15·2 per thousand, i.e. by 2 deaths per year. Our results also suggest that foetal scalp blood sampling is of relatively little value. Alternatively, the high perinatal mortality associated with more common problems such as accidental haemorrhage or prematurity, is once again emphasized. It would appear that under our circumstances in Cape Town such problems should at present receive more direct attention and that sophisticated tests of placental function in labour are of secondary value only.

Furthermore, special foetal diagnostic tests frequently show abnormality only late in labour, by which time obstetric intervention is often limited[8] and in any event it has been shown, both in this series and that of Fenton and Steer,[3] that the mode of delivery with foetal distress is not the direct factor relatable to perinatal mortality. It seems that, when foetal distress has been diagnosed, the important factor is to ensure safe and rapid delivery; the mode of delivery is of secondary importance and should be related to the stage of labour in any individual case. Perhaps the value of foetal diagnostic tests late in labour is that the paediatrician may be warned of the possibility of the birth of an ill baby.

These factors demonstrate the problems facing the obstetrician. Thus, although the responsibility for the significant number of foetal deaths in labour must rest essentially on his shoulders, he is not entirely free from blame in the live-born infant death group, where a close relationship between Apgar score and neonatal death rate was shown. The major difficulty in management facing the obstetrician is that too conservative a policy merely transfers, in many instances, the potential stillbirth into the potential neonatal death statistics. In addition, in many of these cases the mother may be submitted to unnecessary caesarean section or other operative delivery.

CONCLUSION

Foetal distress occurs in about 10% of all patients in labour and approximately 16% of these cases will result in stillbirth or neonatal death. As the obstetrician is able to determine only the group of infants potentially at risk and thereafter effect rapid delivery, it is inevitable that many of these infants will be born in a depressed respiratory state. There is thus a need for improved foetal monitoring techniques to allow for earlier diagnosis and management and the notification of the paediatrician of the need for his services in the labour ward team.

The implication from the present study is that the place of foetal scalp blood sampling and acid-base investigations is probably a small one and the introduction of such a specialized technique in general institutions is probably unjustified until more common preventable factors are eliminated.

However, in specialist institutions it is suggested that a policy of active observation of cases with factors predisposing to placental insufficiency in intensive care wards adequately equipped with foetal monitoring techniques is necessary to diagnose early foetal distress and hence to prevent the potentially salvageable stillbirths and neonatal deaths.

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