FOETAL DISTRESS—IS THE PAEDIATRICIAN NECESSARY?*

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The clinical signs of foetal distress have long been known to be inadequate as a guide to the state of the foetus both *in utero* and at delivery.[1] There is a real and urgent need for better means of assessing the state of the foetus *in utero*. This 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 not only serve to detect foetal anoxia or other disturbances, but provide a guide to the state of the infant at birth.

While assessing the scope and applicability of these new techniques and their possible place in reducing perinatal mortality, an investigation into the incidence and significance of foetal distress was carried out. In addition to its obstetrical implications, the value of such an investigation is twofold. It is of importance in indicating how the paediatrician may help to reduce perinatal mortality and also is of help in the planning of neonatal paediatric services. The purpose of this paper is to present those aspects which are of direct concern to the paediatrician.

METHODS

A prospective study of 1,256 deliveries was instituted at Groote Schuur and Mowbray Maternity Hospitals, covering the period April - July 1968. A standard form (Table I), giving details of any abnormal obstetric features, the occurrence of foetal distress and the outcome of the delivery, was completed by the midwife responsible for every delivery. Each form was checked against the obstetric case notes for accuracy and completeness.

All the cases were divided into one of two groups according to whether 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. For the purposes of comparison antepartum foetal deaths were excluded from the study.

The relationship of foetal distress

to perinatal mortality, mode of delivery, birthweight and 3-minute Apgar score was determined.

RESULTS

The 1,256 deliveries comprised 510 White patients and 746 non-White patients. Racial differences were insignificant in relation to this study. The results presented are therefore for all races combined. Only incidental mention is given to results of obstetric interest, as these will be presented in a separate communication.

There were 117 cases of foetal distress diagnosed, giving an over-all incidence of 9.3%. These cases were subdivided as follows, according to the diagnostic criteria used by the attending medical practitioner during the labour:

1. Meconium-stained liquor amnii only.
2. Foetal heart rate greater than 180/min. or less than 100/min. or irregular.

TABLE I. FORM COMPLETED BY MIDWIFE RESPONSIBLE FOR DELIVERY

FOETAL DISTRESS SURVEY

CODE NO.	SUB-CODE	
1 - 2	....	NAME .... HOSP.NO: ....
3 - 4	....	AGE
5	....	PARITY
6	....	FOETAL DISTRESS DIAGNOSED [YES] [NO]
		LABOUR [SPONT.] [MED.INDUCT.] [SURG.INDUCT.]

OTHER FEATURES PRESENT

				YES	NO
7	....	Diastolic > 90, 2 or more occasions	DIABETES	YES	NO
8	....		P.E.T. - Hypert. + Alb.	YES	NO
9	....		HYPERTENSION	YES	NO
10	....		RHESUS INCOMP.	YES	NO
11	....		PLAC. PRAEVIA	YES	NO
12	....		ACC. HAEM.	YES	NO
13	....		MALPRESENTATION	YES	NO
14	....		CORD PROLAPSE	YES	NO
15	....		POST DATES > 1 WEEK	YES	NO
16	....		OTHER e.g. prematurity		

CLINICAL FEATURES AT PRESENTATION OF F.D.

17-18	....
19-20	....
21	....
22-25	....
26-28	....
29	....
30	....
31	....
32	....
33	....
34	....

DATE	DAY	MONTH	YEAR
TIME		A.M./P.M.	
F.H.R. (lowest or highest)			
RHYTHM	REG.	IRREG.	
MECONIUM	DEFINITELY PRESENT	ABSENT	
	FRESH	OLD	
EXCESSIVE FOETAL MOVEMENT		YES	NO
CERVICAL DILAT.			
LEVEL OF HEAD	ABOVE	AT	BELOW I.S.

OUTCOME OF LABOUR

35-36	....
37-40	....
41	....
42	....
43	....
44	....
45	....
46-47	....
48	....
49	....
50-53	....

DATE	DAY		
TIME OF DELIVERY		A.M./P.M.	
SUD.	YES	NO	INDICATION
INSTRUMENTAL	YES	NO	
C.SECTION	YES	NO	

APGAR SCORE AT 3 MINS. ....

STILLBIRTH	NEONATAL DEATH
APPARENT CLINICAL CAUSE FOR F.D. ....
BIRTH WEIGHT	lbs. ozs.

3. Meconium-stained liquor plus abnormal foetal heart rate as above (strict criteria).

The number and percentage of cases in each subgroup are shown in Table II. The numbers of livebirths, stillbirths and neonatal deaths and corresponding rates in cases with and without foetal distress are shown in Fig. 1 and Table III. Both the neonatal death and stillbirth rates were significantly higher (p = <0·001) in the group with foetal distress.

TABLE II. NUMBER AND PERCENTAGES OF CASES OF FOETAL DISTRESS ACCORDING TO DIAGNOSTIC CRITERIA

	Abnormal foetal heart rate alone	Meconium	Abnormal foetal heart rate plus meconium	Total
No. of cases	47	34	36	117
% of cases of foetal distress	40·2	29·0	30·8	100
% of total deliveries	3·7	2·7	2·9	9·3

TABLE III. MORTALITY RATES ASSOCIATED WITH AND WITHOUT FOETAL DISTRESS

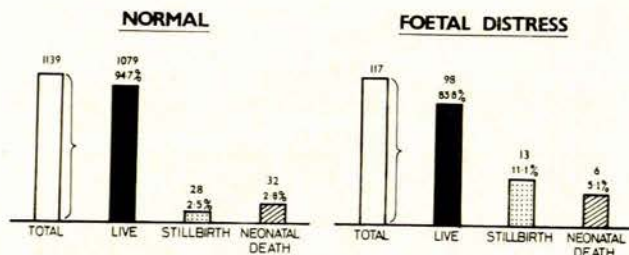| Mortality rates/1,000			No foetal distress	Foetal distress	All cases
Stillbirths	..	..	24·6	111·1	32·6
Neonatal deaths..	..	..	29·7	57·7	32·3
Perinatal mortality	..	..	52·7	162·4	62·9

Fig. 1. The number and percentage of livebirths, stillbirths and neonatal deaths with and without foetal distress.

The perinatal mortality in patients with foetal distress, subdivided according to the criteria used for the diagnosis of foetal distress, is shown in Table IV, and the

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

Diagnostic criteria	Stillbirths /1,000 live & SB	Neonatal deaths /1,000 live	Perinatal mortality /1,000 live & SB
Abnormal foetal heart rate ..	170·2	51·3	212·8
Meconium	29·4	60·6	88·2
Abnormal foetal heart rate + meconium	111·1	62·5	166·6
Total mortality rate ..	111·1	57·7	162·4

percentages of foetal distress deaths subdivided according to diagnostic criteria in Fig. 2. 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 foetal distress deaths) as opposed to 212·8 (52·6% of foetal distress deaths) where alteration in the foetal heart rate was the only diagnostic sign. The perinatal mortality in the meconium
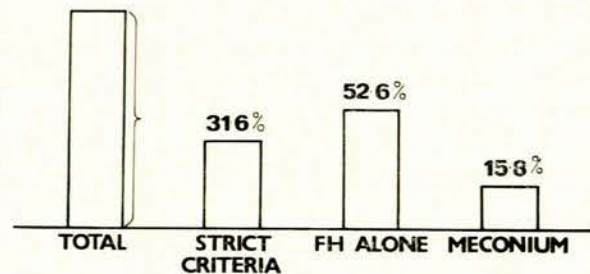

Fig. 2. The percentages of deaths following foetal distress subdivided according to diagnostic criteria.

group of 88·2 (15·8% of foetal distress deaths) was lower than in the other 2 groups but was nevertheless significantly greater than the perinatal mortality of 52·7 in the group without foetal distress. As all 3 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.

The relationship of perinatal mortality, stillbirth and neonatal death rates to the mode of delivery with and without foetal distress is shown in Table V. In cases with-

TABLE V. RELATIONSHIP OF PERINATAL MORTALITY, STILLBIRTH AND NEONATAL DEATH RATES TO MODE OF DELIVERY, WITH AND WITHOUT FOETAL DISTRESS

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

out 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, and caesarean section again has a greater mortality than instrumental delivery. However, where foetal distress has been diagnosed, this relationship no longer appears to apply. Thus, 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 (Table VI). There were no

TABLE VI. RELATIONSHIP OF APGAR SCORE TO LIVE INFANTS AND NEONATAL DEATHS WITH AND WITHOUT FOETAL DISTRESS

Apgar score	No foetal distress				Foetal distress			
	NND		Live		NND		Live	
	No.	%	No.	%	No.	%	No.	%
7–10	10	31·3	1,029	95·4	0	0	78	79·6
4–6	14	43·7	38	3·5	1	16·7	17	17·3
1–3	8	25·0	12	1·1	5	83·3	3	3·1
Total	32	100·0	1,079	100·0	6	100·0	98	100·0

neonatal deaths following foetal distress in infants born with an Apgar score greater than 7 out of 10 points. Alternatively, 5 of the 6 infants who died in the neonatal period following foetal distress were born with an Apgar score of 3 or less.

The incidence of prematurity and the relationship to foetal outcome is shown in Table VII, in which it is

TABLE VII. INCIDENCE OF PREMATURITY RELATED TO FOETAL OUTCOME WITH AND WITHOUT FOETAL DISTRESS

	No foetal distress			Foetal distress		
Outcome	$< 5\frac{1}{2}$ lb.	Total	%	$< 5\frac{1}{2}$ lb.	Total	%
Live	138	1,079	12·7	15	98	15·3
Stillbirth	19	28	67·9	9	13	69·2
Neonatal death	24	32	75·0	2	6	33·3

demonstrated that the majority of the perinatal deaths were associated with a birthweight of less than $5\frac{1}{2}$ lb. On the other hand, where the prematurity rate was low the foetal outcome was relatively good. An important observation relating to the paediatrician was that only 2 of the 6 neonatal deaths following foetal distress were associated with prematurity. Further investigation of these 4 infants revealed no evidence of congenital abnormalities, cerebral haemorrhage or other irreversible damage. The conclusion is that 4 of the 6 neonatal deaths following on foetal distress were potentially salvageable. In contrast, 75% of the infants dying after birth unassociated with foetal distress weighed less than $5\frac{1}{2}$ lb.

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 the Sloane Hospital for Women by Fenton and Steer.[2] The clinical diagnosis is extremely difficult and the various diagnostic criteria have only an indirect relationship to foetal prognosis. The fact that the sole finding of meconium-stained liquor was associated with 15·9% of deaths in the foetal distress group was unexpected. Van Praagh and Tovell,[3] on the other hand, found that the passage of meconium in the absence of foetal heart abnormality rarely represented severe foetal distress. 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 calls for further immediate investigation and treatment.

Unfortunately, foetal diagnostic tests frequently show abnormality only late in labour, by which time obstetric intervention is often limited,[4] and in any event it has been shown in both this series and that of Fenton and Steer[2] 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. 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.

The responsibility for the significant number of foetal deaths in labour must rest essentially on the shoulders of the obstetrician. Nor is he entirely free from blame in the liveborn-infant death group, where a close relationship between Apgar score and neonatal death rate was shown. Fenton and Steer[2] reported an over-all mortality of 5% among their 766 cases of foetal distress. Of these infants 59% were in good condition at birth with Apgar scores of 7 - 10; 21% were in satisfactory condition with scores of 4 - 6; and 13% were severely depressed with scores of 1 - 3. The perinatal mortality in this last group was 33%. These findings indicate a major difficulty in management facing the obstetrician. Too conservative a policy results in a greater stillbirth rate, but too active a policy in many instances merely transfers the potential stillbirth into the potential neonatal death statistics.

The role of the paediatrician in relation to foetal distress is indicated by the following findings. A high neonatal mortality rate was found in infants born with a low Apgar score following foetal distress in labour. Furthermore, 4 of the 6 infants who died in the neonatal period following foetal distress were born with a birthweight of greater than $5\frac{1}{2}$ lb., and none of these infants evidenced congenital abnormalities or signs of irreversible birth trauma. This possibly indicates that the resuscitation and further management of the depressed infant was not satisfactory. As the obstetrician is only able to determine 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 state. The paediatrician should therefore be present at all deliveries associated with foetal distress, irrespective of the mode of delivery, to institute immediate infant resuscitation and premature-infant care. The hope for the future is that intensive care in the labour ward and improved monitoring techniques will warn the obstetrician of the infant at risk before gross clinical changes take place, and allow for the earlier notification of the paediatrician of the need of his services in the labour ward team.

SUMMARY

The results of a survey into the incidence and outcome of clinical foetal distress in labour at Groote Schuur and Mowbray Maternity Hospitals in Cape Town are presented, with special emphasis on aspects relating to the paediatrician. It is shown that foetal distress is associated with a significantly high perinatal mortality rate, irrespective of the mode of delivery. Early notification of the paediatrician and institution of infant resuscitation procedures and premature-infant care are necessary to prevent the potentially salvageable neonatal deaths.

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