Evaluation of fetal movements as an early labour admission test in low-risk pregnancies

T. Farrell[1], *MRGOC, Specialist Registrar*; **L. Seaton**[1], *RGN RM BSc, Staff Midwife*;
P. Owen[2], *MD, MRCOG, Consultant Obstetrician & Gynaecologist*

Ninewells Hospital & Medical School, Dundee; Stobhill NHS Trust,, Glasgow[2] *(U.K.)*

Summary

Fetal movements were quantified in 182 low-risk women in early labour using the Hewlett-Packard M1350A (Boblingen, Germany) fetal heart rate monitor. There were no statistically significant differences in adverse intrapartum or neonatal outcomes detected by the fetal heart rate pattern or fetal movement profile. This study confirms the feasibility of obtaining, a measure of fetal movement in early labour but does not support its use as an admission test in low-risk pregnancies.

Key words: Fetal movement; Intrapartum.

Introduction

It is common practice to perform a 30-minute admission cardiotocograph (CTG) on all women admitted in early labour. This serves as a screening test for fetal well-being and if normal allows the woman to establish labour with intermittent monitoring only. The admission CTG is limited in its ability to predict fetal distress although a normal admission CTG is reassuring [1, 2].

The presence of maternally perceived fetal movements is considered as evidence of fetal well-being in the antenatal period. This association may persist into the early intrapartum period and could be employed as an alternative or complementary admission test. Farrell *et al.* [3] have previously demonstrated an association between reduced fetal movements determined by real-time ultrasound and the need for intrapartum fetal scalp blood sampling.

The aim of this pilot study was to determine if the quantification of fetal movements in early labour by means of Doppler ultrasound could act as a predictor of subsequent intrapartum performance and neonatal outcome.

Methods

During a 3-month period 182 low-risk consenting women admitted to our hospital for early labour (defined as regular uterine activity, cervix 50% effaced and between 2-5 cm dilated) were recruited in the study. All women had uncomplicated term pregnancies. Gestational age was determined by second trimester ultrasound scan. No opiate analgesia was administered prior to fetal assessment as this has previously been shown to reduce movements [4].

The standard admission cardiotocograph was performed for 20-30 minutes with the patient in the semi-recumbent position. A Hewlett Packard 1350A machine was used, which in addition to recording fetal heart rate also records fetal activity ("Fetal movement profile"). Fetal activity was demonstrated in 10 minute epochs as the percentage time fetal movements were detected.

Each participant was asked to remain as still as possible to reduce the incidence of artefacts due to maternal movement. Only those participants able to comply with this request with a technically good recording were included for subsequent analysis.

The fetal heart rate was considered normal if the baseline rate was between 110-150 bpm, fetal heart rate variability was greater than 10 bpm and there were no decelerations present. The average percentage time of fetal activity during the recording was calculated by adding the percentage fetal activity for each 10 minute epoch and dividing this value by the number of 10 minute epochs available for each volunteer.

Outcome measures were the 5 minute Apgar score, operative delivery for fetal distress, intrapartum fetal blood sampling, resuscitation at delivery, admission to SCBU and metabolic acidosis. Metabolic acidosis was defined as a pH <7.2 and base excess >8 mmol/l. Umbilical artery gas analysis was performed on 165 cases.

Statistical analysis was performed using the Chi-square test with Yates correction and Mann-Whitney U test where appropriate.

Results

One-hundred and eighty-two women were included in this study, 115 were primigravida and 67 were parous. All were term pregnancies (median gestational age 40 weeks).

Operative delivery occurred in 22%, of which 40% were for suspected fetal distress. The mean birthweight at delivery was 3460 g (2635-4680 g) and mean umbilical artery pH 7.265 (6.98-7.42) with metabolic acidosis occurring in 10% of the deliveries. Fetal scalp blood sampling was performed in 4% of the women. At delivery 10% of the infants required some form of resucitation and two infants were admitted to SCBU for observation only.

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In 12 (6.5%) women the admission CTG was considered abnormal. Admission CTG was not positively associated with any of the outcome measures (Table 1).

The mean percentage time of fetal activity per 10 minute epoch was 12% (range 2.3-44%). Normal reference values for fetal activity in early labour have not previously been established with the FMP. The fetal movements of those fetuses with normal and abnormal outcome measures were compared using the Mann-Whitney U test. There were no statistically significant differences between the two groups (Table 2).

Table 1. — *The relationship between the admission CTG and neonatal outcome (Chi² test; p<0.05 significance)*

Outcome measure	Abnormal CTG (n=12)	Normal CTG (n=170)	p value		
Apgar 5 min <7	0	1	NS	Sen Spec NPV PPV	0% 93% 99% 0%
Metabolic acidosis (n=165)	1	15	NS	Sen Spec NPV PPV	6% 94% 90% 11%
Fetal blood sampling	0	7	NS	Sen Spec NPV PPV	0% 93% 96% 0%
Operative delivery for fetal distress	3	13	NS	Sen Spec NPV PPV	19% 95% 92% 25%
Resuscitation	1	18	NS	Sen Spec NPV PPV	5% 92% 88% 8%
Admission to SCBU	0	2	NS	Sen Spec NPV PPV	0% 93% 99 0%

Sen = sensitivity
Spec = specificity
NPV = negative predictive value
PPV = positive predictive value
NS = not statistically significant

Table 2. — *The median values of fetal movements for each outcome measure (Mann-Whitney U test)*

Outcome measure		Median number of movements	P value
Apgar 5	<7	12	NS
	>7	12	
Metabolic acidosis	Y	11	NS
	N	12	
Fetal blood sampling	Y	12	NS
	N	17	
Operative delivery	Y	12	NS
	N	12	
Resuscitation	Y	12	NS
	N	13	
SCBU admission	Y	12	NS
	N	12	
Abnormal CTG	Y	11	NS
	N	12	

NS = not statistically significant

Conclusion

The purpose of performing an admission test in early labour is to identify the compromised fetus as soon as possible so that appropriate management can be taken.

Uterine contractions act as a physiological stress to the placental circulation which if deficient may result in fetal hypoxia and subsequently fetal heart rate abnormalities. Alternatively, a normal fetal heart rate recording is reassuring and may be predictive of fetal well-being for the next few hours [1].

Ingemarsson *et al.* [1] previously investigated the value of the admission CTG in a large low-risk population and considered operative delivery for fetal distress as their adverse outcome event. They described a sensitivity of 15%, specificity of 95% and positive and negative predictive values of 8% and 97%, respectively.

A potential disadvantage of the admission CTG is the subjective nature of its assessment in clinical practice.

Inter-observer variation has previously been assessed and found to lead to unjustified intervention [5]. This "mis-reading" of the admission CTG will obviously reduce the predictive ability of a test applied in a clinical setting which is already performing poorly even when interpreted by "experts".

Suggested ways of reducing this inter-observer variation include scoring systems [6] and computerised interpretation systems [7]. In this study we decided to look at the value of quantifying fetal movements which, in the antenatal period, are considered to be a sign of fetal well-being. A sudden reduction or absence of fetal movements may indicate fetal cerebral hypoxia. The potential use of quantifying fetal movements in the intrapartum period is supported by observations demonstrating an association between fetal heart rate accelerations and fetal movements [8]. The number of intrapartum fetal heart rate accelerations correlates with fetal outcome based on Apgar scores [9]. The presence of fetal movements, whether spontaneous or provoked, would have advantages over the standard admission CTG since the subjectivity of interpreting the CTG would be removed. Despite these associations, our study failed to demonstrate any statistically significant difference in the average percentage time of fetal movements between those infants with evidence of intrapartum compromise or compromise at delivery and those without.

The absence of any statistically significant differences may be partly explained by the small numbers participating in this pilot study and also by the low-risk nature of the population. The technical feasability of obtaining the fetal movement profile (FMP) recordings in labouring women has previously been described [4] and is confir-

med by this study. Future studies of the intrapartum FMP should focus on higher-risk pregnancies and be compared with the CTG in a larger low-risk population.

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Address reprint requests to:
DR. T. FARRELL
Department of Obstetrics & Gynecology
Ninewells Hospital & Medical School
Dundee, DD1 9SY (U.K.)