

Fetal movements following intrapartum maternal opiate administration

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Summary: Fetal movements were quantified prior to and after administration of intramuscular Diamorphine in thirteen labouring women. A significant reduction in the number of fetal heart rate accelerations was observed following Diamorphine. Thirty minutes after Diamorphine, all fetal movement parameters had returned to pre-Diamorphine values. If fetal movement detection is to be incorporated into an assessment of intrapartum fetal well being, the transient influence of narcotic analgesia must be allowed for.

Key words: Fetal movement; Diamorphine.

INTRODUCTION

Measurement of fetal activity forms an important component of fetal surveillance in the antenatal period as maternal perception of fetal movements and as part of the Biophysical Profile ⁽¹⁾. Antenatal fetal movements can be objectively quantified using the Hewlett-Packard M1350-A (Hewlett-Packard, Boblingen, Germany) fetal heart rate (FHR) monitor which detects fetal movements using

a Doppler signal from an external ultrasound transducer. The Fetal Movement Profile (FMP) consists of the total number of fetal movements and time spent moving presented in 10 minute epochs along with the FHR pattern and tocograph. Using the FMP Devoe *et al.* ⁽²⁾ observed that the demonstration of antenatal fetal movements enabled better clinical discrimination between normal and pathological non-reactive non-stress tests.

Reduced variability is commonly seen on the intrapartum cardiotocograph after the maternal administration of opiate analgesia. The limitations of current methods of intrapartum fetal monitoring has focussed attention on the development of biophysical methods such as fetal movements. As a preliminary assessment of the performance of the FMP in labour we have evaluated the influence of maternal diamorphine upon intrapartum fetal movements.

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SUBJECTS & METHODS

This study was performed in a teaching hospital with approximately 3600 deliveries per year. This unit offers entonox, opiate and epidural analgesics in labour. The standard opiate analgesic administered is a 10 mg intramuscular injection of diamorphine. Thirteen women requesting opiate analgesia for pain relief in labour participated in the study. They were all in spontaneous labour at term following uncomplicated pregnancies.

Each woman agreed to have continuous FHR monitoring with the HP-M1350-A monitor for 30 minutes prior to and for 60 minutes after receiving the diamorphine. The mothers were requested to remain as still as possible to limit the generation of motion artefacts.

RESULTS

All women were delivered of infants of birthweights greater than the 10th centile for gestational age. There were no operative deliveries for fetal distress. The FMP was initially evaluated by examining the print-out which records the total number of fetal movements and percentage time active in 10 minute epochs. Secondly, an independent observer (PO) examined the cardiotocograph with reference to the number of FHR accelerations per 10 minute epoch; accelerations were defined as increases of 20 bpm or more above the baseline FHR.

Statistical analysis was performed with the Wilcoxon's signed ranks test with statistical significance taken as $p < 0.05$.

Comparison was made between the 30 minute recording pre and post opiate analgesia for number of fetal movements, percentage of time the fetus is active and number of FHR accelerations (Table 1). Significant decreases in the number of fetal movements, percentage time active and fetal heart rate accelerations were found. When the 30-60 minute period was compared with the pre-diamorphine FMP there were no statistically significant differences.

Table 1. — Comparison between the fetal movement profiles pre and post diamorphine.

	Pre-opiate	Post-opiate	P value *
<i>Number of movements</i>			
median	60	38	0.01
minimum . . .	31	11	
maximum . . .	93	83	
<i>Percentage of time active</i>			
median	26.5	11.2	0.005
minimum . . .	4.7	3.1	
maximum . . .	61.1	50.4	
<i>Number of accelerations</i>			
median	5	2	0.02
minimum . . .	0	0	
maximum . . .	9	6	

(*) Wilcoxon's Signed Ranks Test.

DISCUSSION

The principal aim of this observational study was to investigate whether the reduction of FHR variability associated with maternal opiate analgesia in labour was accompanied by a reduction in fetal activity. This was accomplished using the HP-M1350-A monitor which is able to discriminate between Doppler signals obtained from fetal movements and those of FHR signals using a band-pass filter (²); fetal movements are associated with lower frequency signals. In antenatal testing this monitor proved 100% accurate in detecting fetal movements when documented by simultaneous ultrasound recordings (³).

The place of quantified fetal movements as an aid to intrapartum fetal monitoring is not established. Devoe *et al.* (⁴) found there was no significant reduction in fetal activity determined by ultrasound biophysical profile testing within 72 hours of the onset of spontaneous labour. Although fetal movements in the intrapar-

tum period do appear to decrease as labour progresses ⁽⁵⁾.

The results of this study have established that fetal activity is significantly reduced following maternal administration of diamorphine but recovers during the subsequent 30 minutes. This pattern reflects the pharmacokinetics of diamorphine which results in peak maternal plasma levels of the active metabolite within 10 minutes of an intramuscular injection ⁽⁶⁾. Diamorphine crosses the placenta readily resulting in peak fetal plasma levels within a similar period of time. The return of fetal activity reflects the rapid metabolism of the analgesic from areas such as the fetal brain.

The value of Biophysical Profile Scoring and umbilical artery Doppler measurement as methods of assessing fetal well-being in the early intrapartum period is limited ^(5,7). The application of an intrapartum fetal movement measurement similar to the antenatal system used in this study has greater potential by quantifying fetal activity through longer periods of labour rather than during the brief period required to visualize the three movements which fulfill Mannings criteria ⁽¹⁾. Our study has demonstrated for the first time that the FMP can be obtained for prolonged periods of time during the first stage of labour without artefacts. Extending the application of the FMP from the antenatal period to the intrapartum period will need to allow

for the influence of maternal opiate analgesia.

REFERENCES

- 1) Manning F. A., Platt L. D., Sipos L.: "Antepartum fetal evaluation: Development of a fetal biophysical profile". *Am. J. Obstet. Gynecol.*, 1980, 136, 787-795.
- 2) Devoe L., Boehm F., Paul R. *et al.*: "Clinical experience with the Hewlett-Packard M1350-A fetal monitor: Correlation of Doppler-detected fetal body movements with fetal heart rate parameters and perinatal outcome". *Am. J. Obstet. Gynecol.*, 1994, 170, 650-5.
- 3) Melenez T.D., Rayburn W.F., Smith C. V.: "Characterization of fetal body movement recorded by the Hewlett-Packard M-1350 A fetal monitor". *Am. J. Obstet. Gynecol.*, 1992, 167, 700-2.
- 4) Devoe L., Ruedrich D.A., Searle N.: "Does the onset of spontaneous labour at term influence biophysical test parameters". *Obstet. Gynecol.*, 1988, 72, 838.
- 5) Sassoon D.A., Castro L.C., Davis J.L. *et al.*: "The biophysical profile in labour". *Obstet. Gynecol.*, 1990, 76, 360.
- 6) Inturrisi C.E., Max M.B., Foley K.M. *et al.*: "The pharmacokinetics of heroin in patients with chronic pain". *New Eng. J. Med.*, 1984, 310, 1, 213.
- 7) Malcus P., Gudmundsson S., Marsal K. *et al.*: "Umbilical artery doppler velocimetry as a labour admission test". *Obstet. Gynecol.*, 1991, 77, 10-15.

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