

FETAL MOVEMENT—A NEW CLINICAL PARAMETER OF FETAL WELL BEING

by

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Introduction

In a country like ours where, due to economic reasons, we have neither biochemical nor ultrasonic nor sophisticated electronic equipment at our disposal, any test for fetal wellbeing based on purely clinical criteria would be most welcome and useful. In this respect one method that is getting gradual popularity in recent years is the serial assessment of rate and pattern of fetal physical activity. The special attraction of this approach is the fact that it is a direct fetal parameter and hence expected to give first hand information about the fetus.

Rationale behind studying fetal movement (FM) as a parameter of fetal well being

The following is the summary of the review of literature on the subject—

1. Intra-uterine fetal death has been found to be preceded by grossly diminished or absent FM in the preceeding 12 to 72 hours (Pearson and Weaver, 1976).

2. Over 80% patients with grossly diminished or absent FM have been found to show signs of antenatal fetal distress like loss of beat to beat variation, variable deceleration etc. in non-stressed continuous cardiotocography (Sadovsky and Polishuk, 1977).

3. Grossly diminished or absent FM has also been found to be associated with high incidence of fetal distress in labour as evidenced by high incidence of meconium staining, fetal heart abnormality and acidosis on fetal blood sampling (Mathews, 1973; Pearson and Weaver, 1976).

4. Grossly diminished or absent FM has also been found to be a better predictor of imminent fetal death than bi-weekly urinary oestriol estimation (Mathews, 1972; Pearson and Weaver, 1976).

5. Diminished FM has even been suggested to be an evidence of adjustment on the part of growth retarded fetus to the threat of negative energy balance (Mathews, 1972).

The above evidence more than establishes the value of FM monitoring as a test for fetal well-being.

Mechanical monitoring of fetal movement

Various instruments have been employed from time to time in an endeavour

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to monitor FM. Besides these there are some instruments which have actually been specially devised for this particular job e.g. electromagnetic device and piezoelectric device. All the various types of devices used and their mechanism of function have been summarised in Table I.

TABLE I
Devices Used for Studying Fetal Movement

Author	Type of device	Mechanism
Sadovsky <i>et al</i> (1973)	Electromagnetic	Records changes in magnetic field due to FM
Reinold (1973)	Ultrasound	Records echoes from moving parts
Timor Tritsch <i>et al</i> (1976)	Tocodynamometer	Pressure transducer sensing deflections due to FM
Sadovsky <i>et al</i> (1977)	Piezoelectric	Pressure sensing as above
Gettinger <i>et al</i> (1978)	Real time ultrasonic scanner	Echoes-filmed by cine camera

However, there are certain disadvantages of using mechanical fetal movement recorders specially in our country. For a start the cost of the instrument in itself is prohibitive for most units in our country and next comes its local nonavailability. Then there are the other usual inherent problems of using any instrument i.e. its repair and maintenance, requirement of a person to operate it, heavy recurring expense for buying miles of the special papers for recording etc. Due to the last mentioned reason—the duration of monitoring by mechanical recorders has to be limited. Besides, interpretation of any recorders of any form calls for considerable training and experience, which naturally limits their use by specialists. Above all, while none of the instruments is capable of recording 100% FMs, some, in fact, may record maternal movements

which passes as FM on the chart.

Probably due to these various disadvantages of mechanical methods the possibility of fetal monitoring by maternal counting of FM was explored.

Reliability of maternal counting of fetal movement

Sadovsky *et al* (1973) were first to compare maternal counting of FM with the count by a electromagnetic device. The study was repeated by Sadovsky *et al* (1977) by using piezoelectric device. On both these studies they found a remarkable 87-88 per cent correlation. Gettinger *et al* (1978) studied this comparability by the use of real time ultrasonic scanner and also reported similarly significant positive correlation but only in those mothers who felt more than 20 movements during the study period. The correlation, however, was very poor by this method in mothers exhibiting movements fewer than 20 and these mothers, according to them need ultrasonic confirmation of their counting.

In view of this high degree of reliability of maternal counting and its easy and unlimited applicability both for inpatient as well as out-patient services without any cost whatsoever—this method has gained a place in the routine antenatal monitoring of fetus in many units (Mathews, 1973; Sadovsky *et al*, 1977) including ours.

The aim of the present study was to assess the FM rate and pattern of only those fetuses who had excellent outcome in order to assess and establish the normal pattern.

Material and Methods

Mothers primarily selected on their intelligence were given fetal movement charts at random both from out-patient and also as in-patient irrespectively of

parity and whether the pregnancy was normal or abnormal. The period of pregnancy covered was from 35 + to 41 + weeks. Cases of multiple pregnancy, breech presentation, hydramnios and those of unknown gestational age were excluded.

Mothers were asked to keep total six hours recording of their FM per day in three sessions (between 8 AM to 10 AM, 3 PM to 5 PM and 8 PM to 10 PM). They had to be in one place, as far as possible while charting. The decision as to what constitutes FM was left to the mothers.

None of these mothers had any sedation during charting and none of them delivered before 38 weeks. All of them had normal birth and in none of them decision regarding induction, delivery etc. was dependant on FM count. The series was totally devoid of all cases of fetal distress in labour, babies with percentile weight under 10th percentile, those with Apgar under 7 and also those having gross congenital malformation, in order to ensure that only the cases with really normal intrauterine environment are assessed.

The present series consisted of total 200 selected cases collected from amongst patients who attended our unit during the two years period from July 1977. These 200 mothers amongst themselves counted 4565 days of FM. Minimum period for which any mother kept their FM chart was 8 days.

For the purpose of comparison with other series the total number of movements recorded during the 6 hours period of each day was multiplied by two to obtain an arbitrary 12 hours figure.

Results and Analysis of Data

FM and duration of pregnancy

It is evident from Table II that there occurs a significant (33%) drop in the

TABLE II
Showing Relation of Fetal Movement with Duration of Pregnancy

Weeks of pregnancy	No. of movements per 12 hours	
	Average	Range
35+	150	24-426
36+	140	22-366
37+	142	18-646
38+	140	18-738
39+	95	12-615
40+	88	16-228
41+	80	18-336

average number of FM from 39th week of gestation and that the rate of FM is maintained at this new lower level upto 42nd week or upto delivery. Looking at the same column of the table from another angle the other conclusion that may be drawn is that the average rate of FM is higher in earlier pregnancy than around term. The absolute minimum number of movements for various weeks also more or less followed the same suite while no significant pattern was observed in the absolute maximum number of FM with advancing gestation. However, these absolute numbers have no general concluding value because they are only a day's recording of an individual patient.

Frequency of FM

The lowest figure (Table II) noted in our series was 12 movements per day (per 12 hours). This occurred in only two patients (1%) both at 39th week and was present for total 12 days—for 5 days in one case and for 7 days in the other, after which they delivered spontaneously. In both the cases the rate of FM had always been under 20 per day. However, 12 days count out of total 4565 days count is a very insignificant proportion (0.25%).

The highest figure (Table II) noted in

the present series was 738 movements per day (12 hours) and only one patient picked up at 38th week of gestation, recorded it just for one day. However, in this particular case the rate of FM had always been very high (above 600 per day) until her delivery at 39 + weeks.

Cross sectional analysis of general pattern of frequency of FM has been presented in Table III. It will be noted from

TABLE III
Frequency of Fetal Movement

Rate of movements per day (12 hours)	Movements present for No. (%) of days at various rates
Under 20	183 (4.00%)
Between 20-300	4060 (88.93%)
Above 300	322 (7.05%)
	4565 (99.98%)

the table that out of 4565 days in only 183 (4%) days the count was less than 20 per day and in only 322 (7.05%) days it was above 300 per day. Summarily, the important fact that this table points out is that—the rate of FM in nearly 90% days in the present series ranged between 20 and 300 per day (12 hours).

The FM chart of each of 200 cases was also studied in longitudinal manner in order to see if there was any individual pattern. The striking conclusion was that every fetus possesses its individual rate of movement—some being slow, some being average while some being over-active throughout. This analysis also clarified that the range of 20 to 300 of cross sectional study is not true for any single fetus.

Discussion

Let us first examine the relation of FM with duration of pregnancy. Pearson and Weaver (1976) found the median value

of daily fetal movement to be 90 per 12 hours at 32nd week of gestation, falling progressively to 50 per 12 hours at the end of 40th week. Conclusion of Sadovsky and Polishuk (1977) that FM is physiologically low for about two weeks before delivery, goes to support the findings of the above workers and so does the findings of our previous (Debdas and Kaur, 1979) and present study.

Now the general pattern of frequency and the range of FM in normal fetuses (see Table IV). Review of literature

TABLE IV
Reported Frequency of FM

Author	Number of FM
Sadovsky & Polishuk (1977)	4 to 1440/12 hrs.
Aladjem <i>et al</i> (1977)	60/hr. = 720/12 hrs.
Present series	12 to 738/12 hrs.

shows that there is a great variation in the degree of physical activity even amongst the normal fetuses. From as low as 4 to as high as 1440 movements per day (12 hours) have been found to be associated with good fetal outcome (Sadovsky and Polishuk, 1977). In the above context we found the range to be 12 to 738 movements per 12 hours.

This variation in the frequency of FM, in our view, is probably not surprising because every fetus is an individual human being and so expected to have personal liking and disliking for physical activity. The second explanation for this may be that the sensitivity of the mothers to their FM probably varies from person to person. The third explanation of this variation may be the absence of a well defined 'norm' for the mother—as to what to count as FM, as to whether to count even the weakest movement and as to whether to count a long or 'multiple

movement in one go' as single or multiple movements. All this is because the decision as to what constitutes FM is left to the mother. However, since all the above three factors have a constant effect any individual case, the day to day frequency pattern of an individual case in a longitudinal analysis (which is the thing normally done in clinic practice) is unlikely to be affected by any of these. These are the factors, in our view, which are really responsible for the finding of 'individual' rhythm or rate of fetal movement (Sadovsky *et al*, 1977; Debdas and Kaur, 1979 and present study for each individual fetus.

The above knowledge also allows to see the wide range of FM (20 to 300 per 12 hours) noted in 90% of cases of our series in its proper perspective i.e. that the data is derived from very many cases and is not applicable for any isolated case. In fact, such findings would be alarmingly abnormal for any individual case.

As regards significance of any absolute number of FM in relation to fetal outcome, findings of the present study support the findings of Sadovsky and Polishuk (1977) and also that of our previous study (Debdas and Kaur, 1979). The uniform conclusion is that there is no significance to any absolute number of FM provided that they are more or less constant from day to day.

Now the most important parameter of FM—its critical rate (see Table V).

Review of literature suggests that constantly high rate of daily FM has no special significance.

As regards constantly low rate of daily FM, Pearson and Weaver (1976) found FM under 10 per 12 hours in only 2.5% days count in normal pregnancies. In our series in only 4% days count FM was under 20 per 12 hours—our lowest count

TABLE V
Critical Level of FM

Author	Critical level
Pearson (1974)	<11 movements/12 hrs.
Sadovsky & Polishuk (1977)	Sudden substantial drop
	<4 movements/day
	None in 12 hours
Pearson & Weaver (1976)	12 movements/12 hrs.
Present series	12 movements/12 hrs. Sudden drop-45% + Caution 20/12 hrs. Alarm 10/12 hrs.

being 12 movements per 12 hours. While according to Pearson (1974), FM under 11 per 12 hours bears significant correlation with fetal jeopardy, Sadovsky and Polishuk (1977) recorded delivery of normal fetuses with as low FM as 4 to 10 per day. The reasonable conclusion that can be drawn from all these is, if FM is under 20 in 12 hours one should be watchful and if it is under 10 per 12 hours one should probably take it as an alarm signal. However, findings in each case should be interpreted only on the basis of pattern of FM of that particular case in the preceding one week, preferably two weeks. In this connection it is essential to point out that it is quite normal for the FM rate of a healthy fetus to fluctuate from day to day, but, as shown by our previous (Debdas and Kaur, 1979) and present study, it is quite unusual for this fluctuation to exceed 45% of the rate that had prevailed during the previous 7 days and hence the necessity of viewing such occurrence with caution.

Conclusion

Every fetus has its individual rhythm (rate) of physical activity which is more or less constant for an individual fetus with day to day fluctuation within limits.

A sudden drop of 45% or more in FM rate is quite unusual with normal fetus.

A normal fetus generally exhibits more than 20 movements per 12 hours but upto 12 movements per 12 hours may be accepted as normal provided this was the basic pattern of movement for that particular fetus.

Maternal recording of her FM can probably be a useful test of fetal well being.

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