FOETAL BIOPHYSIC MONITORING: ITS EFFECTS ON THE CESAREAN SECTION AND PERINATAL MORTALITY FREQUENCY

G. GENTILE

1st Obstetric and Gynecologic Clinic "P. Sfameni" University of Bologna

SUMMARY

The diffusion of the foetal biophysic monitoring during labour up to become o routine method, has greatly reduced the perinatal mortality.

Nevertheless, it must not be forgotten that other factors have surely contributed to the decreased perinatal mortality: the more constant and careful control of high risk pregnancies and more collaboration with neonatologists for the assistance of stressed neonates.

Concerning the increased incidence of cesarean section, we can say that, in our study, it is mainly due to the use of monitoring.

In fact, in our Institute, the largest part of this increase, was due to foetal distress, diagnosed by foetal monitoring, often associated to other factors.

Today, labour is considered as a fatigue test during which, the foetus periodically undergoes more or less intense "sollecitations".

In fact, numerous clinical and experimental observations lead to the conclusion that, during labour there is periodically a reduction of the oxygen perfusion to the foetus.

The physiological basis of this reduction is represented by the periodical succession of the uterine contractions.

These considerations point out that, during labour the continuous and intensive "observation" of the foetal state is always necessary.

Due to the techniques of E. H. Hon ([1, 2, 3]) and R. Caldeyro-Barcia ([4]), the last few years have seen an improvement of the instrumental semeiology which allows a continuous foetal monitoring.

In fact, the continuous registration of the foetal heart rate, together with that of the uterine dynamics, allows a steady continuous surveillance of the foetus in utero during labour.

That explains a large distribution and use of the foetal biophysic monitoring during the last years to the extent that various Authors underline the opportunity to use it as routine.

This research presents and discusses results obtained at the 1st Obst. & Gyn. Clinic "P. Sfameni" of the University of Bologna, by the use of the foetal biophysic monitoring.

These results, with particular concern to the perinatal mortality and cesarean section rate, have been compared to those in relation to a three years period preceeding the use of the FHR as routine in the same clinic.

MATERIAL AND METHODS

Four cardiotocographs model 8030 A of Hewlett Packard, have been used. This type of monitor allows the use of different monitoring techniques in one instrument; this offers four methods in reading the foetal heart rate: direct

Table 1.

		No. of cases	%
FHR	with ECGF	696	28.8
	with ultrasounds	1720	71.2
Uterine contraction	with intrauterine catether	75	3.1
	with external tocography	2341	96.9

foetal ECG, abdominal ECG, ultrasounds and phonocardiogram.

The uterine activity can be monitored by an internal or an external system.

The whole instrument is quite simple to use and doesn't present great difficulties for the staff of the delivery-room.

All the patients of this study have delivered at the 1st Obst. & Gyn. Clinic "P. Sfameni" of the University of Bologna.

The foetal biophysic monitoring has been introduced at the 1st Obst. & Gyn. Clinic of the University of Bologna at the end of 1974 and it was sporadically used till the beginning of 1976 (less than 10% of the patients) when monitoring technique, also for the increase of monitors, has dramatically increased.

From that moment, in fact, the use of the monitor with patients in labour, has increased constantly until it became a routine.

The FHR was registered by an external (using an ultrasound transductor placed on the maternal abdomen) or internal system (using the ECGF derived from an electrode forming a spiral placed on the foetal presented part).

The uterine contraction was also registered by an external (pressure's transductor placed on the maternal abdomen) or internal system (intrauterine catheter connected to an electromanometer connected, at its turn, to a monitor).

During each of the two periods studied, different parameters were examined, as the incidence of the cesarean section and its main indications, the Apgar score at birth, and the perinatal mortality.

RESULTS

From the 1st of January 1973 to the 31st of December 1975, 196 out of the 5378 women who have delivered at the 1st Obst. & Gyn. Clinic of the University of Bologna, were monitored during labour (3.6%).

During the following three years (January 1976-December 1978) 1615 out of the 2416 who delivered in our Clinic, underwent a monitoring.

The decreased number of deliveries during the second period examined by us, is not due to a drastic decrease of the mortality in Bologna, but to a reduced number of beds of the 1st Obst. & Gyn. Clinic, due to the creation of a new Institute.

As already mentioned, both the FHR and the uterine contractions were registered by an external or internal system.

Table 1 reports the frequency of the different techniques used.

Table 2 shows the number of deliveries and of patients monitored every year, including 1973 which is the year preceeding the introduction in our clinic of the monitoring.

Initially the foetal biophysic monitoring was mainly used if one or more of the following conditions were present:

1) labour of a high risk pregnancy;
2) amniotic fluid containing meconium;
3) irregular FHR;
4) use of oxytocics.

It is evident that the foetal biophysic monitoring, initially used in case of "high risk", after few years became a routine technique.

This was possible for the increase of instrumentation, but also for the increased sensibilization of the staff working in the delivery-rooms.

Table 2. — *No. of deliveries and patients monitored.*

Year	Total no. deliveries	Monitored patients	
		No.	%
1973	2216	0	0
1974	1664	58	3.5
1975	1498	138	9.2
1976	808	313	38.8
1977	728	555	76.2
1978	880	747	84.9

Table 3. — *Cesarean section rate.*

1973	112 C.S.	out of 2216 deliveries	5.0%
1974	118 C.S.	out of 1664 deliveries	7.1%
1975	105 C.S.	out of 1498 deliveries	7.0%
Total	335 C.S.	out of 5378 deliveries	6.2%
1976	60 C.S.	out of 808 deliveries	7.4%
1977	75 C.S.	out of 728 deliveries	10.3%
1978	60 C.S.	out of 880 deliveries	6.8%
Total	195 C.S.	out of 2416 deliveries	8.1%

Table 3 shows the rate of cesarean sections during the period preceeding, and during that following the monitoring.

The total rate of cesarean section has increased from 6.2% during the pre-monitoring period, to 8.1% during the last 3 years; the rate of the primitive cesarean section was respectively of 3.4% and 6.1%.

The increased frequency of cesarean section is clearly lower than that found by other Authors ([5, 6, 7, 8, 9,10]), particularly the american ones, but it is important to underline that the foetal monitoring had an important role on this increase.

In fact, considering the main indications of the cesarean section (table 4), we can notice that the uterine contraction pathology and the foetal distress, both diagnosed by monitoring, have undergone a notable increase, while the other indications have remained almost constant, including the breech presentation, in which case our line of conduct is not interventionist.

In fact, only 9.8% of the patients with a foetus in breech position underwent a cesarean section.

The number of cesarean sections performed for foetal distress, is lower than that of cesarean sections made for other indications.

Furthermore, foetal distress, considered separately, has represented only 8.9% of the indications to a cesarean section, during the post-monitoring period, for in most of the cases it is associated to other factors as dilatation dystocia, missed progression of the presented part, and cephalo-pelvic disproportion.

Table 5 shows the clinical conditions of the infants at birth, evaluated calculating the Apgar score at 1 and 5 minutes from delivery.

We have subdivided the values of the Apgar score into two categories:

a) Apgar score 10-7 (not stressed infant);

b) Apgar score 6-0 (stressed infant).

The number of infants with low Apgar score at 1′ has clearly decreased since 1976 and such a phenomenon can be ascribed to the changed obstetric attitude towards those patients, in whom the foetal electronic monitoring showed precociously the existance of a foetal distress.

The immediate measures adopted were represented by a change of position of the patient, by the administration of oxygen and/or tocolytics, and by the preparation of the operating room.

In fact, in case of worsening of the foetal distress and in those situations in which, in spite of the mentioned measures, the foetal distress persisted and the delivery was not expected within a short time, the abdominal way was used.

In our Institute, during the three years preceeding the introduction of the moni-

Table 4. — *Indications to cesarean section.*

Indications	1973-75	1976-78
Pathology of uterine contraction	47 %	54 %
Foetal distress	29 %	41.6%
Maternal pathology	10 %	8.7%
Anomalous presentation	13 %	11.4%
Foetal dystocia	14 %	12 %
Placenta previa	6.5%	6 %
Placenta disruption	1.8%	2 %
Aged primiparae	12.9%	13.3%
EPH gestosis and eclampsia	4 %	3.3%
Preceeding infertility, sterility stillbirth	5.1%	4 %
Prolonged pregnancy	3 %	2.2%
Others	14.7%	15.2%

Table 5. — *Apgar score at 1 and 5 minutes.*

Apgar score	1973/75				1976/78			
	1 minute		5 minutes		1 minute		5 minutes	
	No.	%	No.	%	No.	%	No.	%
0-6	522	9.7	156	2.9	164	6.8	39	1.6
7-10	4856	90.3	5222	97.1	2252	93.2	2377	98.4

toring, the perinatal mortality was of 18.8%.

Table 6 shows the brusque decrease in the perinatal mortality when the foetal monitoring became a routine.

It is interesting to notice that during the last three years of our study, exactly half of foetal deaths occured before hospitalization, and 72% of foetal deaths occured after hospitalization weighted less than 1500 g. During labour no foetal death occured.

CONCLUSIONS

The reduction of perinatal mortality is one of the most important aims of the obstetrician.

The instrumental semeiology previously described, nowadays allows an intensive surveillance of the foetal well-being during labour, with such an accuracy that, in almost all the cases, it is possible to diagnose precociously an eventual foetal distress.

Pardi *et al.* (1973) ([11]) have tried to define the probabilities of an association of a certain type of FHR with a foetal acidosis and with a neonatal depression after delivery, and therefore to define the diagnostic and prognostic value of the continuous FHR registration.

Table 6. — *Perinatal mortality.*

Deaths/1000 born	1973-75	1976-78
Perinatal	18.8	10.2
Foetal, before hospitalization	8.4	5.1
Foetal, after hospitalization	4.4	3.1
Neonatal	6.0	2.0

Statistics concerning the perinatal mortality in our Institute show its marked decrease in the last few years.

This decrease is parallel to the increased application of foetal monitoring and to the increased number of cesarean sections; consequently the logic conclusion is that all these factors are connected.

In fact, the possibility of monitoring the effects of labour on the foetus provides indications on the best way of delivery of a stressed foetus.

Nevertheless, it must not be forgotten that other factors have surely contributed to the decreased perinatal mortality; the more constant and careful control of high risk pregnancies and more collaboration with neonatologists for the assistance of stressed new-born infants. Concerning the increased incidence of cesarean section we can say that, in our study, it is mainly due to the use of monitoring.

In fact, in our Institute, the largest part of this increase, was due to foetal distress, diagnosed by foetal monitoring, often associated to other factors.

This is in contrast with the results reported by Hughey *et al.* ([6]), in which the first indication to cesarean section was represented by the rise of a dystocia.

The fact that pathologic variations of the FHR appear frequently during labours of normal at term pregnancies should induce the obstetrics to practice a foetal biophysic monitoring, in all the cases and not only in case of "at risk" labour.

Therefore, it is desirable a more and more frequent use of monitoring, which seems to be related only to an increased instrumentation.

BIBLIOGRAPHY

1) Hon E. H.: *Am. J. Obst. Gyn.*, *75*, 1215, 1958.
2) Hon E. H.: *Am. J. Obst. Gyn.*, *83*, 333, 1962.

3) Hon E. H., Paul R.: *An atlas of fetal heart rate patterns.* New Haven, Conn., Harty Press, p. 25, 1968.
4) Caldeyro-Barcia R. *et al.*: *La fréquence du coeur foetal. Signification de ses variations.* XXI[e] Congr. Fed. Soc. Gyn. Obst. langue franç., Lausanne, 1965, Masson publ., Paris, p. 395, 1967.
5) Gabert H. A., Stenchever M. A.: *Am. J. Obst. Gyn., 118,* 534, 1974.
6) Tutera G., Newman R. L.: *Am. J. Obst. Gyn., 122,* 750, 1975.
7) Lee W. K., Baggish M. S.: *Obst. Gyn., 47,* 516, 1976.
8) Gabert H. A., Stenchever M. A.: *Obst. Gyn., 50,* 275, 1977.
9) Amato J. C.: *Obst. Gyn., 50,* 269, 1977.
10) Hughey M. J., La Plata R. E., McElin T. W., Lussky R.: *Obst. Gyn., 49,* 513, 1977.
11) Pardi G., Tucci E., Uderzo A., Figini E., Zanini D.: *Ann. Ost. Gin. Med. Perin., 94,* 156, 1973.