

ACCELERATIONS IN « INTRA-PARTUM » CARDIOTOCOGRAPHIC RECORDING

I. Correlation with perinatal outcome

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SUMMARY

The Authors examine 1994 cardiotocographic recordings during labour, equivalent to 89% of all deliveries of the same period. They evaluate the tendency of the acceleratory activity in the single recordings during their whole length, comparing it with the perinatal outcome, evaluated by the perinatal mortality and the Apgar score at 1' and 5'. They conclude that the presence of accelerations could be considered, when present in a certain degree, a sure index of foetal well-being or of good possibility of foetal reactions to hypoxic stimuli, allowing a more cautious evaluation of the cardiotocogram.

INTRODUCTION

The examination of recent researches on the interpretation of "intra-partum" cardiotocographic recording, shows a diffuse tendency to a more global evaluation of all cardiotocographic aspects and to a contemporaneous reduced exploitation of single "patterns" significance, even of those usually considered as prognostically unfavourable, as bradycardia and late decelerations.

It has been attempted to point out more fine cardiotocographic characteristics, accompanied by contemporaneous classic "patterns", that can modify, either in defect or in excess, their prognostic significance (^{1, 2, 3, 4}).

The reevaluation of the accelerations importance, already studied in many investigations which have clearly demonstrated their favourable prognostic character in cardiotocography during pregnancy (^{5, 6, 7, 8, 9}), has assumed particular importance.

The role that can be ascribed to them in the intra-partum recording, has not yet been completely clarified. One of the obstacles that has interfered with this, was the contemporaneous presence, during labour, of periodic and sporadic accelerations, unlike what happens during pregnancy, when the almost absolute totality of accelerations is represented by sporadic ones.

If the foetal heart rate increase in relation to foetal movements, is by now diffusely explained as expression of foetal well-being, we cannot say the same of the FHR increase in relation to uterine contractions that, when it assumes an uniform and repeated character, is interpreted by some Authors (^{11, 12}) as the expression of mild foetal hypoxemia.

Our intention is to prob the examination of the accelerations prognostic significance that, before delivery, according to our experience, assumes a predictive role of foetal conditions which is more im-

portant than any other cardiotocographic parameter.

The clinical impression and the theoretic presuppositions, according to which a foetus whose FHR increases consuming more oxygen and energy in relation to a decreased income of both, must be considered as provided with a good reserve⁽¹³⁾, have induced us to consider the acceleratory activity in its complex, with no distinction between sporadic and periodic accelerations, and ascribing to it a significance of good foetal reactivity, even in presence of mild circulatory obstacles as compressions or stretchings on the funiculus due to uterine contractions.

The observation of the rare occurrence of uniform and recurrent periodic accelerations, already noticed by Krebs^(14, 15), and on the other hand the frequent appearance of accelerations combined with variable decelerations, has also contributed to this choice.

We retain that the explanation of the significance of some controversial cardiotocographic aspects, and even more the individuation of some signs that can represent a sure expression of a maintained foetal reactivity, even in presence of mild "distress", can be useful particularly in the routine use of "intra-partum" monitoring.

In fact, in this case, unlike the application limited to high risk pregnancies, the problem that often the obstetrician has to resolve is to decide whether to proceed to an instrumental extraction only on the basis of informations, some times uncertain, provided by the cardiotocographic recording, in absence of other clinical, biochemical or anamnestic signs of foetal distress.

MATERIAL AND METHODS

Our study includes 1994 "intra-partum" cardiotocograms, recorded in the period 22-IX-1975/23-IV-1979, pertinent to single pregnancies. The total number of deliveries in the same period has been 2262, with 89% of monitored cases.

Not monitored cases have been almost exclusively represented by patients hospitalized in second stage of labour, or by elective cesarean sections. Recordings have been obtained by HP 8051A cardiotocograph, at a speed of 1 cm/min.

Contractions have been recorded by an external transducer (excluded very few cases of internal tocographic recording), while FHR has been recorded by an external transducer in 80% of the cases and by a spiral electrode on foetal scalp, at least during part of labour, in 20% of the cases.

We have considered for the lecture, only cases with at least half an hour recording, evaluable before the beginning of the second stage of labour (equivalent to 1742 cases), which has been determined either by graphic signs on the recording or, in absence of the latter, by the tendency of the FHR and in particular of the tocographic recording, on which during the second stage of labour, "spikes" due to expulsive contractions, appear.

We did not consider the second stage recording, either for the lack of uniformity present in literature on the interpretation criteria of this part of recording, either for the almost absolute absence of the parameter accelerations (main subject of our investigation), due to vagal hypertone caused by compression on the foetal head.

Therefore, all recordings have been read from their start up to the end of the first stage of labour.

Each recording has been divided in many half hours, starting from the end of the first stage of labour, up to a maximum of 16 half hours. The number of both sporadic and periodic accelerations, has been evaluated for each single half hour. We have considered as acceleration every FHR rise that, characterized by a brusque increase and as much rapid decrease, did not last less than 30" and had an amplitude measured by the "floating line" at least equivalent to the amplitude of cyclic variations in that part of recording.

Perinatal outcome has been evaluated by the perinatal mortality and the Apgar score (at 1' and 5') data, systematically surveyed at birth by the pediatrician.

We have included in our study also patients who received during labour antispastics and analgesics, in consideration either of the mainly practical aims of the investigation, either of the fact that these drugs have a depressing action on the acceleratory activity, and therefore could not lead to an overestimation of the favourable significance of accelerations.

RESULTS

467 out of the total number of recordings considered in our investigation, pre-

sented a length longer than 10 half hours (excluded the second stage of labour). In this group of cases (group c) that, for its numerical consistence and for the lack of selection on the basis of the perinatal

The comparison between the average of the single half hours and the corresponding one of the two group of cases, the first with an average Apgar between $1'$ and $5' < 7$ (group b, fig. 1) and the

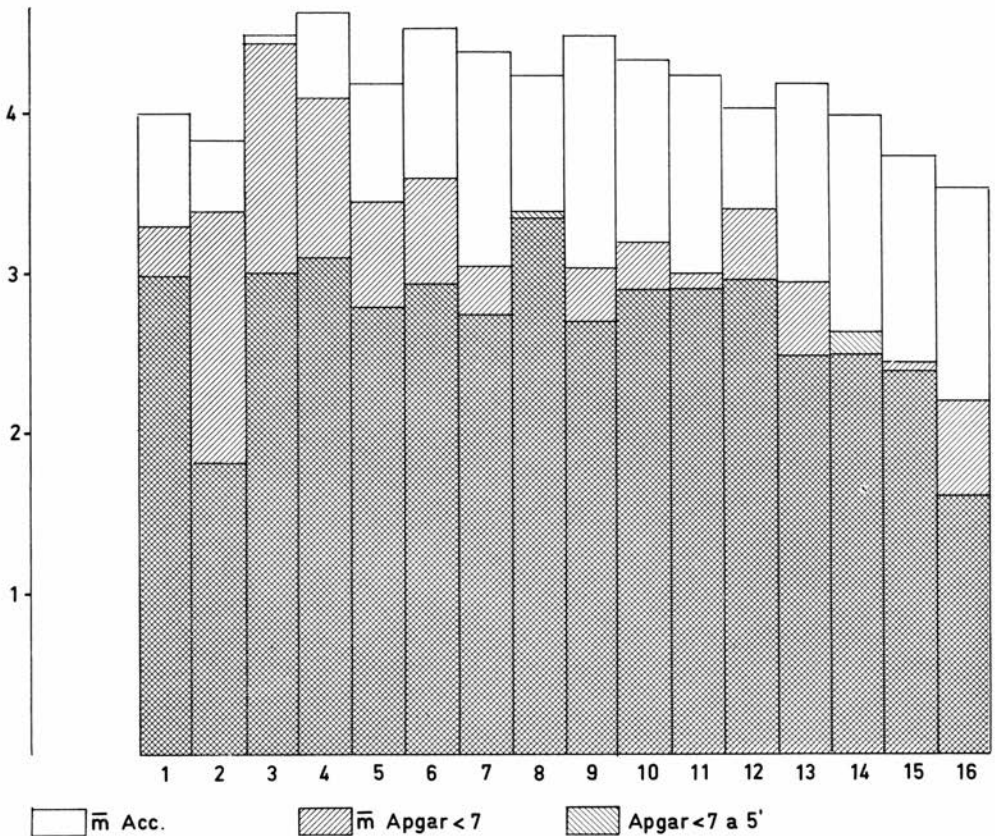


Fig. 1. — Trend of the average number of accelerations during the first stage of labour.
Legenda: \bar{m} Acc.: average number of accelerations in the 16 half hours preceding the second stage of labour in the cases with a FHR registration of at least 5 hours (group c); \bar{m} Apgar < 7 : average number of accelerations in the cases with average Apgar between $1'$ and $5' < 7$ (group b); Apgar < 7 at $5'$: average number of accelerations in the cases with Apgar score at $5' < 7$ (group a).

mortality, represents a sample homogeneous and representative of all the casuistry, we have calculated the accelerations average for every single half hour (fig. 1), that is resulted to have a grossly decreasing tendency, except for the first hour.

second with Apgar at $5' < 7$ (group a, fig. 1), shows that the averages of these two groups, in particular of the latter, keep a level lower than the first, with a constant difference for all the 8 hours considered. Moreover, the lowest values

of group c are higher than the highest of group a.

Numerical data for the calculation of fig. a, b, c, are reported in tab. 1, in which the result of the statistical comparison between the averages of group b and a and of group c, by independent bidirectional t-Student test, is represented.

The comparison between the average number of accelerations/30' (calculated for every single recording in all its lenght, excluded the second stage of labour) and the perinatal outcome (average Apgar between 1' and 5' and/or perinatal mortality), see fig. 2, shows a lack of unfavourable outcome in presence of an ave-

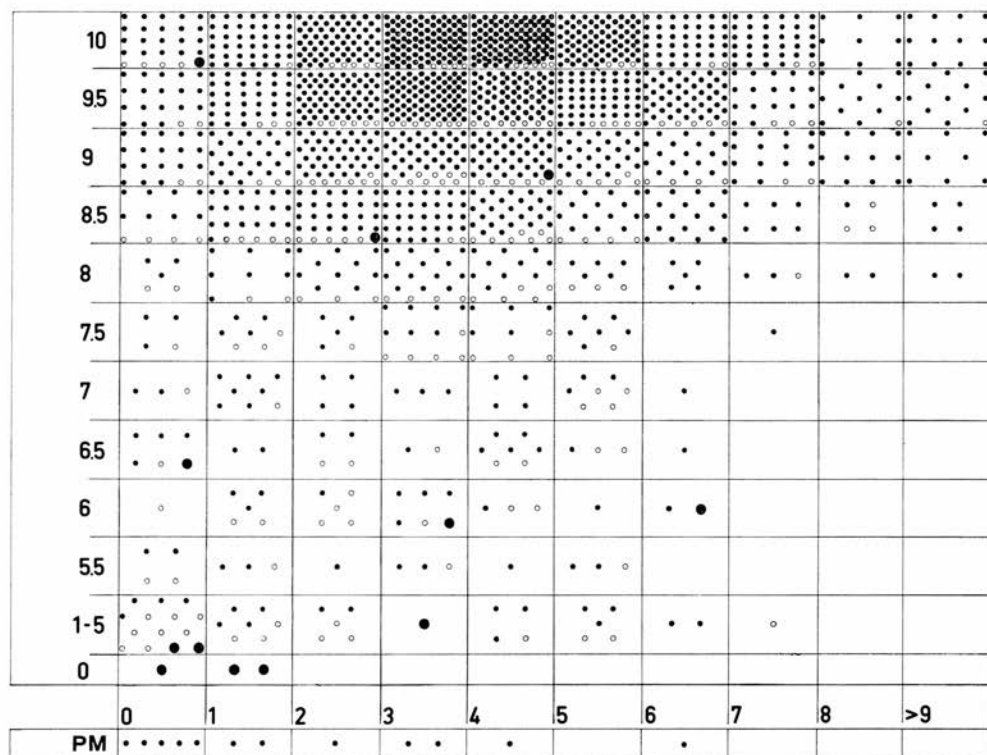


Fig. 2. — Distribution of all cases considered in relation to the average Apgar between 1' and 5' and to the average number of accelerations in the whole recording.

Legenda: •: PE; ○: traumatic deliveries; ●: dead during labour or within 7 days from delivery; MP: perinatal mortality.

The accelerations average of group b and a seem significantly lower, particularly for what regards the last two hours before the second stage of labour. Moreover, it is opportune to remember that group c includes also cases with unfavourable perinatal outcome, so that significance is in reality higher.

The newborn dead with an average number of 6 accelerations (in the last half hour of the first stage of labour they were even 8), presented a congenital cardiopathy. Moreover, it must be pointed out that in the cases with average Apgar < 7 there is a number of traumatic deliveries

Table 1. — Average number of accelerations in the 16 half hours preceding the second stage of labour in the cases: a) which had an Apgar score at 5' < 7; b) which had an average Apgar between 1' and 5' < 7; c) which had a FHR registration of at least 5 hours (no matter the perinatal outcome).

group c)		\bar{m} Acc.														
\bar{m}	4.00	3.87	4.50	4.63	4.22	4.57	4.39	4.27	4.50	4.37	4.26	4.04	4.19	3.97	3.74	3.55
DS	2.96	3.00	2.94	4.95	2.90	3.11	3.02	3.02	3.36	3.85	3.22	3.88	4.10	2.92	2.93	3.95
No. data	129	140	220	231	325	325	439	440	445	446	460	462	465	466	467	466

group b)		\bar{m} Apgar <7														
\bar{m}	3.31	3.41	4.44	4.10	3.47	3.59	3.06	3.37	3.04	3.22	2.98	3.41	2.95	2.48	2.45	2.20
DS	2.26	3.14	3.34	2.94	2.53	2.56	2.60	2.69	2.60	2.54	2.60	2.24	2.46	2.37	2.65	2.53
No. data	12	18	25	31	36	37	40	44	53	55	61	64	74	87	91	102
p	<0.05		<0.05		<0.05		<0.05		<0.05		<0.005		<0.001		<0.005	

group a)		Apgar <7 a 5'														
\bar{m}	3.00	1.78	3.00	3.09	2.80	2.93	2.76	3.41	2.71	2.89	2.91	2.96	2.50	2.63	2.42	1.62
DS	2.58	2.97	2.35	3.65	2.79	2.67	3.04	3.36	2.70	2.66	2.70	2.65	2.18	2.43	2.93	2.32
No. data	9	9	11	11	15	15	17	17	17	19	22	23	28	35	36	39
p	<0.05		<0.05		<0.05		<0.05		<0.05		<0.005		<0.02		<0.005	

Legenda: m: average number of accelerations; VC: variation coefficient; SD: standard deviation; p: significance statistical control.

almost equivalent to that of normal deliveries (50 versus 54), with consequent decrease of the average Apgar mainly due to a low value at 1'.

DISCUSSION

The results obtained by the examination of our casuistry, seem to confirm a prognostic favourable interpretation of the presence of accelerations also in cardiotocographic recordings during labour.

The accelerations frequency (evaluated in a group of recordings with length above 5 hours) is resulted decreasing, even if not dramatically: the lower values of the first two half hours compared with those of the third, are probably due to the smaller number of cases, but even more, to a lower number of contractions and of foetal movements, and sometimes to periods of foetal rest in presence of an initial labour (in fact we are at 8 hours from the beginning of the second stage of labour).

The tendency to an accelerations decrease as labour advances, is probably to connect, on one side to the vagal tone increase, parallel to the increase of the compressive action on the foetal head, on the other side to a certain degree of metabolic "stressing" of the foetus subjected to repeated hypoxic damages due to contractions.

The good uniformity of the difference of level between the average number of accelerations in the groups with negative outcome (in particular in group "a" which is certainly the most indicative for the presence of a real neonatal distress) and that of group "c", confirmed by the quite homogeneous distribution of the different half hours averages in each recording, as observed in the analytical examination of our cases, has induced us to compare the perinatal outcome with the accelerations average during the whole length of recording up to the beginning of the second stage of labour, and not

only with their number during the last 30 and 60 minutes. From the comparison with the average Apgar it appears as reliable the indication, already reported in literature (¹⁴), of the presence of at least 5 sporadic accelerations in 30' as sign of foetal well-being.

The fact that in our study a real lack of unfavourable outcome has occurred only with an average of more than 6 accelerations, is to connect both to the presence of periodic accelerations, beside the sporadic ones, and to the type of neonatal parameter used.

The Apgar score, even being the only neonatal index that, for having been attributed to all newborns in a quite homogeneous way, it was utilizable for the evaluation of our casuistry, must not be considered as very exact parameter, particularly for what regards the values of the first minute: on this subject it must be noticed how around half of the newborns with average Apgar between 1' and 5' < 7 was born by traumatic delivery (breech, V.E., C.S., forceps).

CONCLUSIONS

The presence of a good acceleratory activity seems to be indicative, even in "intra-partum" cardiotocographic recording, of a foetal well-being condition. The availability of this index, could be particularly precious in the routine use of cardiotocography during labour, that frequently put the obstetrician in front of the choice if to interfere or not instrumentally, only on the basis of uncertain informations provided by the cardiotocographic recording, in absence of other anamnestic, clinical and biochemical elements.

Moreover, in presence of a normal recording and of 5-6 accelerations every 30' it seems reasonable to retain to have a foetus in good conditions, in which case the surveillance could be limited only to exclude the occurrence of acute foetal distress in advanced second stage of labour.

BIBLIOGRAPHY

- 1) Paul R. H., Aida Khazin Suidan, Sze-Ya Yeh, Schifrin B. S., Hon E. H.: *Am. J. Obst. Gyn.*, 123, 206, 1975.
- 2) Bossart H.: *Fisiologia circolatoria feto-placentare*. Congresso della Società Siciliana di Ostetricia e Ginecologia, Taormina, 1977.
- 3) Luerti M., Busacca M., Vignali M.: *Possibilità di informazioni "devianti" mediante monitoraggio bio-fisico in travaglio di parto*. Congresso della Società Siciliana di Ostetricia e Ginecologia, Taormina, 1977.
- 4) Zanini B., Paul R. H., Huey J. R.: *Am. J. Obst. Gyn.*, 136, 47, 1980.
- 5) Lee C. Y., Di Loreto P. C., Logrand B.: *Obst. Gyn.*, 48, 19, 1976.
- 6) Trielweiler M. W., Freeman R. K., James J.: *Am. J. Obst. Gyn.*, 125, 618, 1976.
- 7) Schifrin B., Doctor G., Lapidus M.: *Obst. Gyn.*, 54, 433, 1975.
- 8) Rochard F., Schifrin B. S., Goupil F., Legrad H., Blottiere J., Sureau C.: *Am. J. Obst. Gyn.*, 126, 699, 1976.
- 9) Ismail Barrada M., Edwards L. E., Hakan-son E. Y.: *Am. J. Obst. Gyn.*, 134, 538, 1979.
- 10) Luerti M., Busacca M., Vignali M.: *Ann. Ost. Med. Perin.*, 49, 3, 1978.
- 11) James L. S., Yeh M. N., Morishima H. O., Daniel S. S., Caritis S. N., Niemann W. H., Indyk L.: *Am. J. Obst. Gyn.*, 126, 276, 1976.
- 12) Wood C., Walker A., Yardley R.: *Am. J. Obstet. Gynecol.*, 134, 523, 1979.
- 13) Lee C. Y., Panfilo C., Di Loreto P. C., D'Lane J. M.: *Obst. Gyn.*, 45, 142, 1975.
- 14) Krebs H. B., Petres R. E., Dunn L. J., Jordan H. V. F., Segreti A.: *Am. J. Obst. Gyn.*, 133, 762, 1979.
- 15) Krebs H. B., Petres R. E.: *Am. J. Obst. Gyn.*, 133, 773, 1979.