A COMPARISON OF QUALITATIVE AND QUANTITATIVE EVALUATION OF CARDIOTOCOGRAM IN THE MONITORING OF HIGH-RISK PREGNANCY

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SUMMARY

85 high risk pregnant women were evaluated by RIA of total estriol, unconjugated estriol and HPL by ultrasonic measurement of foetal BPD and by NST and Fischer's score.

In all, 277 evaluations were made. The Authors found a good correlation between results of the cardiotocographic tests and levels of HPL and measurements of foetal BPD. A low correlation was noticed between the levels of total and unconjugated estriol and the characteristics of cardiotocography. The evaluation of the cardiotocographic tests, according to Lee and Coll., resulted better than according to Fischer's score. The contemporary qualitative and quantitative evaluation of the cardiotocograms seems to reduce significantly the false-positive results and to half the false-negative results of the other tests for foeto-placental function.

Results were analysed.

The last few years have seen the increasing development of methods to test the fetal intrauterine conditions, based on the study of cardiotocogram in basal conditions or after the administration of various drugs to the mother. Some Authors ([3, 10, 13, 18]) devised score-tests offering a quantitative evaluation of the fetal intrauterine conditions according to the cardiotocographic characteristics.

But – in 1976 – Lee, Di Loreto, and Lograng ([11]) stressed the importance of cardiotocographic accelerations, responding to fetal intrauterine movements, in showing the fetus intrauterine well-being.

Many other Authors ([1, 2, 5, 7, 8, 15, 17, 19, 20, 24, 25, 26, 27, 29]) subsequently adopted and confirmed the validity of what is currently known as 'non-stress test' (NST).

We have recently examined the possible use of Fischer's cardiotocographic test in the monitoring of high-risk pregnancies ([22]) comparing it with other tests for feto-placental function. We have therefore thought of an interesting comparison, again in a group of high-risk pregnancies, of the diagnostic and prognostic value of Fischer's quantitative and Lee's qualitative tests.

MATERIAL AND METHODS

This study concerns the results of a total of 277 fetoplacental function tests performed on 85 high-risk pregnant patients hospitalized at the Institute of Gynecologic and Obstetric Clinic of Padua University.

In each case we took into account the results of the following fetoplacental function tests, performed on the same day:

a) RIA of total plasma estriol;
b) RIA of unconjugated plasma estriol;
c) RIA of plasma HPL;
d) echography of fetal DBP;
e) Fischer's cardiotocogram score;
f) Lee and Coll.'s cardiotocogram score.

The test results were classified as normal or pathologic according to their being above or below the 10th percentile in the assay-curves based on the general case-series of our laboratory.

Each newborn's characteristics and perinatal fate were also considered.

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The newborns were classified as eutrophic (A.G.A.), large (L.G.A.) or small for age (S.G.A.) according to the weight curves of our general case-series.

We evaluated the distribution of reactive and non-reactive NST according to the results of the other considered tests and parameters and took note of the percentage of diagnostic correlation. The results of each evaluation were statistically analysed.

We studied the corrections brought about by NST in the false-negative and false-positive results of the other tests.

Finally, we analysed how the cardiotocogram evaluation by both methods improves the diagnostic value of the overall monitoring for fetoplacental well-being, based on the other examined tests. The results of our study were all statistically analysed.

RESULTS AND COMMENT

Table 1 reports the distribution – in percent – of reactive ad non-reactive NST according to the other fetoplacental parameters and tests performed on the same patients on the same day.

Normal reactive NST are constantly mainly associated with normal results in the other tests too. However, the diagnostic correlation is statistically highly significant only with the results of HPL RIA, fetal DBP evaluation, Fischer's test and fetal intrauterine growth characteristics. These results confirm the foreseeable and obvious high diagnostic correlation between NST and Fischer's test as well as the poor correlation with total and unconjugated estriol plasma levels (which we had previously stressed in the case of Fischer's test too) ([22]).

Table 2 reports the rectified false-negative and false-positive test results after NST. NST clearly improves the diagnostic value of all the considered tests, but this improvement is statistically highly significant only for total and unconjugated E_3 false positive results.

Finally, table 3 shows how the performance or both Fischer's and Lee's tests can rectify the diagnostic errors associated with the evaluation of fetoplancental function merely by traditional methods.

Table 1. — *Distribution (in percent) of reactive and non-reactive NST, according to the values of the other fetoplacental tests and parameters.*

	NST			
Total plasma E3	Reactive %	Non-reactive %	Diagnostic correl. %	Statistical analysis
Norm. val.	78.0	22.0		non-
Path. val.	71.0	29.0	58.7	significant
Unconjugated plasma E3				
Norm. val.	75.7	24.3		non-
Path. val.	66.7	33.3	59.6	significant
H.P.L.				
Norm. val.	79.0	21.0		
Path. val.	44.4	55.6	77.5	$p<0.01$
D.B.P.				
Norm. val.	84.4	15.6		
Path. val.	42.9	57.1	79.9	$p<0.01$
Fischer's test				
$\geqslant 8$	97.5	2.5		
<8	15.0	85.0	93.9	$p<0.001$
Apgar score at 1′				
$\geqslant 7$	75.7	24.3		non-
<7	60.9	39.1	68.0	significant
Intrauterine growth				
AGA+LGA	79.5	20.5		
SGA	63.2	36.8	65.0	$p<0.01$

In particular, the remarkable – and statistically highly significant – reduction of false positives and the halving of false negatives in our case-series, confirm once again the usefulness of a many-sided evaluation of the fetoplacental function, so as to choose the best therapeutical approach and guarantee the best possible perinatal outcome.

CONCLUSION

The following conclusions can be drawn from the results of our study:

Table 2. — *Incidence (in percent) of the false-positive and false-negative results of the tests for fetoplacental function before and after diagnostic correction following NST.*

Test for fetoplacental function	False-positive results			False-negative results		
	Basal %	After NST correction %	Statistical analysis	Basal %	After NST correction %	Statistical analysis
Total plasma E3	15.5	1.8	$p<0.01$	10.0	7.0	n.s.
Unconjugated plasma E3	16.3	2.4	$p<0.01$	12.7	7.2	n.s.
HPL	2.4	0	n.s.	27.1	21.0	n.s.
DBP	4.2	0.9	n.s.	26.2	22.0	n.s.
Fischer's test	20.1	16.4	n.s.	27.4	26.0	n.s.
N.S.T.	13.6	—	—	21.4	—	—

a) the performance of both qualitative and quantitative evaluations of the cardiotocogram, in pregnancy and in basal conditions, remarkably improves the diagnostic reliability of the tests for fetoplacental function;

b) the examined cardiotocographic tests, taken individually, show an incidence of false positives and false negatives comparable to that of other tests for fetoplacental function;

c) Lee's quantitative test (NST) shows a higher diagnostic and prognostic reliability than Fischer's score test in the evaluation of the cardiotocogram characteristics;

d) the two examined cardiotocographic tests, though diagnostically highly correlated, do not always agree and cannot therefore be mutually exclusive;

e) NST reduces the false-positive and false-negative results of the other fetoplacental tests more than Fischer's score test;

f) however, it is the performance of both Lee's and Fischer's tests on the cardiotogram that enables us to rectify the highest number of diagnostic errors in the traditional monitoring of high-risk pregnancies for fetoplacental function;

g) with regard to the own characteristics of the two examined cardiotocographic tests, we can conclude that their complementary – not substitutive – use in high-risk pregnancy monitoring provides us with an excellent method to improve the diagnostic quality and reliability of this kind of monitoring. The consequent more correct therapeutical approach guarantees the best possible perinatal outcome.

Table 3. — *Effects of NST and Fischer's test on the diagnostic accuracy of the monitoring for fetoplacental function.*

	Total	Rectified by NST and Fischer's T	Rectified by Fischer's T	Rectified NST only	Remaining	Statistical analysis
False-positive results	47/277 16.97%	32/47 68.09%	0	6/47 12.77%	9/277 3.25%	$p<0.01$
False-negative results	23/277 8.30%	6/23 26.09%	1/23 4.35%	3/23 13.04%	13/277 4.69%	n.s.

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