PLASMA LEVELS OF S.P.-1 GLYCOPROTEIN (PSbetaG) IN NORMAL AND POOR INTRAUTERINE FETAL GROWTH

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SUMMARY

Circulating levels of pregnancy-specific beta-1 glycoprotein were measured serially by radial immunodiffusion during the third trimester of pregnancy. In patients with poor intrauterine foetal growth the S. P. - 1 levels were generally below the 10th centile. This finding suggests that the measurement of S. P. - 1 appears to provide a good additional biochemical evidence of placental function.

During gestation appear several new plasma proteins, pregnancy-specific or pregnancy-associated; between the formers, all originated in the trophoblast, the S.P.-1 has recently been identified.

Many studies are necessary in evaluating the clinical usefulness of measurements of this protein ([1]). In the second half of pregnancy the S.P.-1 seems a reliable index of poor intrauterine foetal growth and placental function ([2, 3, 4]). The plasma concentration of S.P.-1, about 30 times greater than the h.P.L. one, should give the possibility of measurement by relatively more simple techniques. For the determination of maternal plasma S.P.-1 in the second and third trimester it is controversial if the radiommunoassay is necessary: radial immunodiffusion may be more convenient, less expensive, appropriate for sensitivity and for large-scale work.

MATERIAL AND METHODS

Subjects included in this study were in - patients of the Obstetric Department of Padua; blood was collected prospectively in heparinized tubes, plasma was separated by centrifugation and stored at $-20^{\circ}C$ until assay.

The outcome of pregnancy was assessed retrospectively; all the subjects were studied serially, blood samples being obtained twice a week in the second half of the pregnancy.

Poor intrauterine foetal growth was defined as a birth weight below the 10th centile, corrected for gestational age, sex and parity.

To establish the normal range were used the values obtained from women without antenatal complications, who delivered a single infant between 38 and 40 weeks after the last menstruation, with a birth weight between the 10th and 90th centiles. The normal range of S.P.-1 was calculated by ranking the values of each week of gestation and dividing into centiles; these centiles were approximated in the least square sense by a polynomial of the 2nd degree to obtain a regular curve fitting. The biochemical data were correlated using the Spearman's rank correlation coefficient to avoid making assumptions about the distribution of the values.

Plasma concentration of S.P.-1 were measured on duplicate by radial immunodiffusion technique using the "Partigen" plates and standards supplied by Boehringwerke A.G.

Table 1. — *Normal range of S.P.-1 after the 30th week of pregnancy divided into 10th, 50th and 90th centiles (mg/100 ml).*

Week of pregnancy	Centiles		
	10th	50th	90th
30	6.51	7.87	14.50
31	6.87	9.16	14.60
32	7.38	10.21	14.89
33	7.94	11.06	15.68
34	8.47	11.75	16.74
35	8.89	12.31	17.89
36	9.10	12.77	18.99
37	9.03	13.18	19.87
38	8.58	13.55	20.38
39	7.68	13.93	20.36
40	6.24	14.35	19.65

RESULTS

The plasma concentrations of S.P.-1 throughout normal pregnancy after the 30th week are shown in the table 1.

During the normal pregnancy the levels of S.P.-1 rose until term, reaching a plateau at the 38th week, with a skewed distribution.

The coefficient of variation at term was 30.92% (table 2), similar to that of other authors: Towler [5] reported a coefficient of variation at the 40th week of 31.9% with immunodiffusion method and Gordon [6] a coefficient of variation at 38 to 40 weeks of 9% with R.I.A.

Table 2. — *Plasma concentration of S.P.-1 at term (mg/100 ml).*

Mean	14.13
Standard deviation	4.37
50th centile	14.35
90th centile	19.65
10th centile	6.24
Coefficient of variation %	30.92

Table 3. — *Frequency of depressed plasma S.P.-1 levels in subjects with poor intrauterine foetal growth.*

N° of patients	26
N° with depressed S.P.-1	15 (57%)
N° of samples	138
N° with depressed S.P.-1	76 (55%)

The coefficient of variation for replicate assay was 2.5% and for day-to-day variation was 5.4%, quite similar to those previously reported by Towler [5].

In our casuistry there were 26 patients with poor intrauterine foetal growth (birth weight below the 10th centile); the protein concentration was depressed in two or more occasions in 15 out of 26 patients (table 3).

The correlation between S.P.-1 and birth weight, S.P.-1 and placental weight, S.P.-1 and crown-rump lenght at birth are shown in table 4.

A significant correlation was found between levels of S.P.-1 and placental weight and a not significant one for birth weight and crown-rump lenght.

DISCUSSION

The plasma concentration of S.P.-1 in the second half of pregnancy is sufficiently high to be measured by immunodiffusion method: this is cheap, not requiring complex equipment and therefore

Table 4. — *Spearman's rank correlation coefficient (r_s) between S.P.-1, birth weight, placental weight and crown-rump lenght in patients at the 35th week of pregnancy with poor intrauterine foetal growth.*

	Birth weight	Placental weight	Crown-rump lenght
S.P.-1	0.33**	0.78 *	0.47**

* Significant at the 1 per cent level.
** N.S.

most convenient. The reliability of this technique, with low coefficient of variation for replicate assay, is sufficient for clinical purpose and the radioimmunoassay is not necessary for monitoring the placental function. A low metabolic clearance rate of S.P.-1 (the plasmatic half-life is about 24 hours) makes stable values from time to time, with low coefficient of variation day-to-day, and permits a good assessment of placental function by means of blood collection once or twice a week.

Clinical value of S.P.-1 measurement in detecting the poor intrauterine foetal growth ([6, 5]) is confirmed by our observations and thus this protein may be considered a specific marker of placental function and foetal wellbeing.

The lack of correlation between S.P.-1 levels and birth weight not only in physiological conditions, as previously found ([2, 6, 7, 8]), but also in poor foetal growth, is due to the fact that this protein is directly a product of the placenta rather than reflecting the foetus itself.

The correlation between S.P.-1 levels and placental weight, low in normal conditions, tends to become high in presence of poor foetal growth: therefore the measurement of S.P.-1 plasma levels reflects, as well as h.P.L. or oestriol, the placental nutritive function.

In conclusion, it appears that, from evidence obtained in this study, the S.P.-1 measurement is a cheap and reliable test in monitoring the second half of pregnancy.

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