ESTIMATION OF PLASMA LEVELS OF PREGNANCY-SPECIFIC B1-GLYCOPROTEIN IN NORMAL AND ABNORMAL PREGNANCIES†

by

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The importance of foetal well being and the improvement and prevention of perinatal mortality and morbidity should be the pre-eminent aim of the twentieth Century obstetrics. This is essential for the health and welfare of the perinatal outcome in this era of restricted families.

For many years obstetricians and biochemists have been searching for a reliable method to determine the function of the foeto-placental units and thereby foetal well-being, by assessing a wide range of materials secreted by the placenta.

Human placenta synthesizes and contains a number of proteins which are more or less specific for this reproductive tissue. Of these proteins some have the function of hormones, others are enzymes. Other proteins are the placental antigens whose functions are still unknown; they have been detected by immunochemical methods.

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In 1971, these antigens were isolated from the human placental extracts, by Bohn. These antigens have been called schwangers chafts-proteins (SP) i.e. "Pregnancy Proteins".

The 'Pregnancy specific' proteins all appear to originate in the trophoblast. One of them is human placental lactogen (HPL) and the other are identified as "Pregnancy Specific B_1-Glycoprotein" (PSBG) or SP_1 By Bohn (1971). SP_1 or pregnancy specific B_1-glycoprotein is specific for gravidity and is not found in normal sera. In normal pregnancies the levels of SP_1 rises steadily with advancing pregnancy till term and reaches to about 25-30 mg/100 ml.

Estimation of SP_1 was hence carried out in normal as well as abnormal pregnancies to compare and conclude whether it could really be a marker for placental function.

Material and Method

The cases were selected from the outpatient department, as well as indoor patients and also from private clinics.

One hundred and four cases were included in the present study. Out of 104, 70 were of normal pregnancies and 34 were of abnormal pregnancies. Proper case history and investigation records were maintained.

Special investigations as in case of Rh incompatibility and diabetes, like rising titre, blood sugar, fasting and post prandial were done.

TABLE I
Type of Abnormal Cases

S. No.	Type of Cases	No. of cases
1.	Twin Pregnancy	3
2.	Rh-incompatibility	3
3.	Diabetes	2
4.	E P H Gestoses	
	(i) with substantial impairment	9
	(ii) without substantial impairment	7
5.	Foetal death	4
6.	Post-maturity	4
7.	Missed abortion	1
8.	Antepartum haemorrhage	1
	Total	34

Among the abnormal pregnancies, majority of the cases (9) had edema, proteinuria and hypertension (E.P.H.) gestoses with substantial foetal or placental impairement. In all pregnancies associated with substantial foetal or placental impairement, one of the following criteria was present-protracted heart rate change during delivery, Intrauterine growth retardation (I.U.G.R.), subsequent intrauterine foetal death or placental infarction involving 25 per cent or more of the placental volume.

The next group includes EPH gestoses without substantial foetal or placental impairement, I.U.D. and post maturity.

One ml of blood was drawn from the antecubital vein with a sterilised dry syringe and was immediately transferred to a dry sterilized test tube along its side. The test tube was placed in a standing position just to fecilitate the separation of serum from the clot and was left at the room temperature for one hour. The separated serum was transferred in another test tube and was centrifuged. The supernatant serum was then put in a test-tube by the clean pipette. The samples were then preserved at –20° after adding a pinch (0.5 mg) of sodium oxide, which acts as a preservative.

Method of Estimation of Immunoglobulins

1. Single radial diffusion method of Mancini and Carborana (1965) was used for quantitative determination of pregnancy-specific B_1-glycoprotein.

Principles

An agar plate is prepared incorporating specific antigen throughout the agar. The patient's serum is put into small antigen wells. A diffusion into the agar forms rings or antigen-antibody precipitate around the wells. The diameter of precipitation rings reflect the concentration of antibody.

From the above Table the characteristics of serum SP_1 concentration in high-risk and other types of abnormal pregnancies can be observed.

In twin pregnancies the levels invariably exceeded mean values.

In 3 cases of Rh incompatibility and 2 cases of diabetes, there is a considerable scatter within the normal range. However, the number of cases are too small for any conclusion to be drawn.

In cases of EPH gestoses without substantial foetal placental impairment, the PSB_1 G levels were found to lie within the 2S range, but all of them were substantially lower than the means of normal pregnancies.

In EPH (edema, proteinuria hypertension) gestoses associated with substantial foetal or placental impairment and in pregnancies with subsequent foetal death, serum SP_1 levels were within 2S range

TABLE II

Comparison of Serum SP_1 Levels in Abnormal and Normal Cases During the Same Periods of Gestation mg./100 ml.

Types of Cases	Weeks of gestation	No. of Cases	Levels PS B_1 G in abnormal Cases	PSB_1 in normal cases
Twins	34	1	24.0	21.17
	38	2	31.5	24.81
Rh in Compatibility	28	1	13.0	14.24
	38	1	24.2	24.81
	40	1	23.0	25.133
Diabetes	28	1	14.6	14.24
	38	1	23.0	24.81
E P H gestoses with substantial	34	3	11.9	21.17
foetal or placental impairment	38	3	13.4	24.81
	40	3	13.0	25.133
E P H gestoses without substan-	34	2	19.8	21.17
tial foetal or placental	38	2	23.0	24.81
impairment	40	3	24.0	25.133
Foetal death	36	3	11.0	22.2
	32	1	8.0	15.03
Missed abortion	26	1	0	9.925
Post-maturity				
40 + 11 days		2	10.5	25.0 (40 weeks)
40 + 16 days		2	10.0	25.0 (40 weeks)
A.P.H.	34	1	10.6	21.17

in only 2 cases, in all others they were well below the 95 per cent confidence limit.

In 4 cases of I.U.D. at 36 and 34 weeks, the levels were below normal and in 1 case of missed abortion of 26 weeks gestation serum SP_1 was not detected.

Four cases of post-maturity of 11 and 16 days from the last menstrual period, showed the SP_1 level 10.5 mg. per cent and 10.0 mg. per cent respectively which is lower than normal at term. The lower level can be due to infarction of placenta.

One case of ante partum haemorrhage probably a case of placenta praevia at 34 weeks gestation, showed a much lower than the normal mean of 21.71 mg. per cent.

Discussion

A number of pregnancy and placental proteins have been detected and characterised by Bohn (1971) 2 of them apparently are specific to the placenta, namely the so called pregnancy Specific B_1-glycoprotein, SP_1 and a placental protein PP5. The knowledge on most of the immunologically defined placental antigens is still very poor. SP_1 and PP5 are the best characterised proteins of this group and the only one which so far have been isolated in pure form.

By using an indirect immunofluorescent staining method SP_1 or pregnancy specific B_1-glycoprotein were found to be localised mainly in the epithelial cells of the syncitio-trophoblast.

The present study was primarily under-

taken with a view to detect plasma SP_1 in abnormal pregnancy and to compare its level with normal pregnancy at same period of gestation.

There were 9 cases of E.P.H. gestoses along with substantial foetal or placental impairment. In these cases and in pregnancies with subsequent foetal death, serum SP_1 levels were below 95 per cent confidence limit, except in 2 cases where it was still within 2S range.

A series of 17 such cases have been recorded by Tatra *et al*, 1974. They found that SP_1 levels mostly lie below the 2S level and in addition show a downward trend on follow up.

The next large group include E.P.H. gestoses without substantial foetal or placental impairment, I.U.D., postmaturity. In 3 cases of E.P.H. gestoses without substantial foetal or placental impairment, the PSB_1 level was substantially lower than the means of normal but found to lie within the 2S range. A series of 5 such cases have been observed by Tatra *et al* (1974). They also draw the conclusion that this possibly reflects an already existent placental insufficiency and thus this test become an efficient indicator of placental function.

In 4 cases of foetal death serum SP_1 was well below normal limit.

Four cases of post-maturity of 11 and 16 days from the last menstrual period, showed the SP_1 levels 10.5 mg. per cent and 10.0 mg. per cent respectively. The lower level of SP_1 than normal mean is probably due to infarction of placenta. There has not been any reported work on post maturity so far hence a comparision could not be made.

Unfortunately, due to the non-availability of the Tripartigen immunodiffusion plates, our series of cases are small, but the detection of this substance in serum opens a vast area of study, since this is a direct indication or parameter of placental function. Starting from its earliest detection to diagnose pregnancy its value in other condition of unknown case of placental insufficiency or small for dates babies can never be over emphasised. Its measurement by radio-immune assay can be very accurate and more useful. Besides its use as parameter for picking up high-risk pregnancy cases, in the detection and follow up treatment of trophablastic disease (Horne *et al*, 1977) its use and, utilisation towards fertility control (Bohn, 1975) is very fascinating.

Since SP_1 is essential for maintainance of pregnancy it had been possible to block its action by immuno chemical techniques and thus interfering with implantation or early development of the embryo.

From the evidence gained to-date PSBG or SP_1 appears to provide the earliest good indicator of placental function and thus may serve good parameter for foeto placental well being (Jandial *et al*, 1977).

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