OBSERVATIONS ON THE MUCOPROTEIN CONTENT OF THE LIQUOR AMNII IN NORMAL PREGNANCY, PRE-ECLAMPTIC TOXAEMIA AND ECLAMPSIA*

by

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Although the protein of the liquor amnii has been investigated by a number of authors in normal and complicated pregnancies the variations in the mucoprotein content has received scant attention. Mucoprotein and glycoprotein are conjugated proteins where mucopolysaccharides occur as prosthetic group. The distinction between mucoprotein and glycoprotein is based on the amount of carbohydrate. Glycoproteins contain less than 4 per cent carbohydrate in the molecule, whereas mucoproteins contain more than 4 per cent carbohydrate (Harper, 1967). They are soluble in ordinary protein precipitants like perchloric acid or sulphosalicylic acid, but are precipitated by phosphotungstic acid (Keyser, 1964).

Sandmeyer (quoted by Shrewsbury, 1933) stated that the protein of liquor amnii comprised of albumin, globulin and ovovitelline like substance. Bevis (1953) reported that besides albumin and globulin, the amniotic fluid contained moderate amount of mucoprotein. Heron (1966) observed the presence of glycoprotein in liquor amnii from rhesus sensitised pregnancies only. Lambotte and Uhlenbruck (1966) isolated a new class of hexosamine rich glycoprotein which they called "amniomucoids". In the present work, the mucoprotein of liquor amnii has been estimated in cases of normal pregnancy, pre-eclamptic toxaemia and eclampsia.

Method of Study

One hundred and ten pregnant women between 38 to 41 weeks of gestation with cephalic presentation belonged to the following types:

(i) Normal pregnancy (24 cases)—Blood pressure upto or below 120/80 mm of Hg. without oedema, proteinuria, rhesus incompatibility, or any other systemic diseases.

(ii) Mild and moderate pre-eclamptic toxaemia (28 cases)—Blood pressure upto 160/110 mm of Hg. with oedema and/or albuminuria. In seven cases the upper limit of blood pressure was 140/90 mm of Hg. with detectable oedema and/or proteinuria, which was grouped as mild pre-eclamptic toxaemia.

(iii) Severe pre-eclamptic toxaemia (26 cases)—Blood pressure above 160/110 mm of Hg. with marked oedema and/or proteinuria.

(iv) Eclampsia (32 cases) all were emergency admissions and had many fits before being hospitalised. Thirteen babies were still born.

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The liquor amnii was collected aseptically, either from the hindbag of water using a Drew-Smythe catheter, or from the forebag of water presenting at the vulva during the second stage of labour or by transabdominal amniocentesis.

Estimation of mucoprotein was done according to the method described by Winzler, *et al* (1948) and Varley (1967) as stated below;

0.5 ml. of liquor amnii was mixed with 4.5 ml. of 0.85 per cent saline; to this 2.5 ml. of 1.8 M perchloric acid was added dropwise with shaking. After 10 minutes, it was filtered through two layers of Whatman No. 50 filter paper. To 5 ml. of the filtrate, 1 ml. of phosphotungstic acid reagent (Varley, 1967) was added, mixed and after 10 minutes, centrifuged at 2000 r.p.m. for 10 minutes, decanted. The precipitate was washed with 5% phosphotungstic acid solution and centrifuged. The supernant was decanted and the precipitate was mixed to dissolve in 2 ml. of N sodium hydroxide solution. To it was added 5 ml. of biuret reagent. Test tubes were placed in water bath at 37°C for 15 minutes and read at 540 millimicrons in spectrophotometer against a blank containing 5 ml. biuret reagent and 2 ml. of N sodium hydroxide, and the result obtained from a graph drawn by plotting the optical densities against known concentrations of the protein.

Results

Table I indicates the mucoprotein content of the liquor amnii in normal pregnancy, pre-eclamptic toxaemia and eclampsia. Comparison of the results between normal pregnancy and different degrees of toxaemia have also been shown in the same table.

TABLE I

Comparison of the Mean Mucoprotein Content (mg. per 100 ml.) of the Liquor Amnii Between Normal Pregnancy and Different Degrees of Toxaemia and Between Increasing Degrees of Toxaemia

Groups of cases	No. of cases	Mean	S.D.	S.E.	t	df	P-Value
Normal pregnancy	24	186	25.98	5.30	4.10	50	Less than 0.001
Mild and moderate pre-eclamptic toxaemia	28	296	141.50	26.79			
Normal pregnancy	24	186	25.98	5.30	4.44	48	Less than 0.001
Severe pre-eclamptic toxaemia	26	269	91.58	17.90			
Normal pregnancy	24	186	25.98	5.30	8.05	54	Less than 0.001
Eclampsia	32	348	109.09	19.40			
Mild and moderate pre-eclamptic toxaemia	28	296	141.50	26.79	0.89	52	Not significant
Severe pre-eclamptic toxaemia	26	269	91.58	17.90			
Severe pre-eclamptic toxaemia	26	269	91.58	17.90	2.99	56	Less than 0.01
Eclampsia	32	348	109.09	19.40			

TABLE II

Comparison of the Mean Content of Liquor Amnii (mg. per 100 ml.) Between Meconium Stained and Unstained Samples of Liquor Amnii in Normal and Toxaemic Pregnancies

Type of cases	Meconium stained liquor (A)			Unstained liquor (B)			't' ratio of difference of mean between (A) & (B)	P-value
	No. of cases	Mean	S.D.	S.E.	No. of cases	Mean	S.D.	S.E.		
Normal pregnancy	4	214	17.77	7.88	20	180	20.85	4.65	2.07	Less than 0.05
Mild and moderate pre-eclamptic toxaemia	9	435	92.39	30.79	19	231	37.29	8.57	8.60	Less than 0.001
Severe pre-eclamptic toxaemia	5	419	86.36	35.74	21	233	42.07	9.18	5.05	Less than 0.001
Eclampsia	7	441	23.25	8.80	12	270	73.65	21.28	7.30	Less than 0.001

Table II shows the comparison of the mean mucoprotein content of liquor amnii between meconium stained and unstained sample of liquor amnii in normal pregnancy, pre-eclamptic toxaemia and eclampsia.

The samples from intrauterine foetal death (13 samples) were not included. The mucoprotein content of the unstained samples of liquor amnii in normal pregnancy and in different degrees of toxaemia has been shown in Table III.

Discussion

The mean mucoprotein content was higher in pre-eclamptic toxaemia and eclampsia compared with normal pregnancy but a linear relationship between the degree of pre-eclampsia and mucoprotein level was not observed (Table I). Comparing the mean mucoprotein level between the meconium stained and unstained samples of liquor amnii, a statistically significant increase of mucoprotein content in meconium stained liquor was observed in normal and toxaemic cases (Table II). Evidently, the rise of mucoprotein content of the meconium stained liquor amnii in foetal asphyxia was due to contamination of the liquor amnii with the meconium. But, the mucoprotein content in the unstained samples of liquor amnii in pre-eclamptic toxaemia and eclampsia was significantly higher than in normal pregnancy (Table III). The reason for this rise of mucoprotein in unstained samples of liquor amnii in toxaemia of pregnancy is not clear. Considering the placental insufficiency in toxaemia of pregnancy (Browne and Veall, 1953) as a factor leading to foetal hypoxia it is likely that the mucoprotein content in clinically clear samples of liquor amnii may be raised to a significant level by occult meconium which is not

TABLE III

Comparison of the Mean Mucoprotein Content (mg. per 100 ml.) of the Unstained Samples of Liquor Amnii Between Normal Pregnancy and Different Degrees of Toxaemia and Between Increasing Degrees of Toxaemia

Groups of cases	No. of cases	Mean	S.D.	S.E.	t	df	P-value
Normal pregnancy	20	180	20.85	4.65	5.48	37	Less than 0.001
Mild and moderate pre-eclamptic toxaemia	19	231	37.29	8.57			
Normal pregnancy	20	180	20.85	4.65	5.11	39	Less than 0.001
Severe pre-eclamptic toxaemia	21	233	42.07	0.18			
Normal pregnancy	20	180	20.85	4.65	4.11	30	Less than 0.001
Eclampsia	12	270	73.65	21.28			
Mild and moderate pre-eclamptic toxaemia	19	231	37.28	8.57	0.16	38	Not significant
Severe pre-eclamptic toxaemia	21	233	42.07	9.18			
Eclampsia	12	270	73.65	21.28	1.57	42	Not significant

enough to stain the liquor over and above the mucoproteins obtained from other likely sources as the amniotic epithelium, chorion (Scandrett, 1963; Curzen, Rigley and Barber, 1970), surface of the umbilical cord (Danishefsky and Bella, 1966), foetal urine (Maxfield and stefanaye, 1962), foetal skin (Meyer and Chaffee, 1941), Stomodeum of the foetus (Burgi, 1964) and/or maternal blood (Nir, Sadovsky and Weisenberg, 1965; Anderson, 1965, Horowitz, 1967). If the presence of meconium is accepted as one of the indications of foetal hypoxia, then the amount of mucoprotein in liquor amnii may be a parameter of its severity.

Summary

Mucoprotein content of liquor amnii was estimated in 110 cases at or near term which included normal pregnancy, pre-eclamptic toxaemia and eclampsia. The mucoprotein content was consistently higher in meconium stained samples of liquor amnii and also in toxaemia of pregnancy. The possibility of mucoprotein estimation as a parameter of foetal hypoxia has been discussed.

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