STUDY OF ALPHA-FOETO PROTEIN (AFP) IN LIQUOR AMNII IN DIFFERENT STAGES OF PREGNANCY

by

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Introduction

Alpha-foeto protein, a foetal protein was first identified by Bergstrand and Cjar in 1956. It has been isolated from several embryonic tissues, i.e. yolk sac, placental tissues, foetal liver, gastro-intestinal tract and renal cells. All these tissues synthesize this protein. Production of this protein is believed to be related to foetal growth in early pregnancy, when it helps to maintain the foetus, as an allograft in the genetically incompatible environment (Smith, 1972 and Grimley, 1976).

A.F.P. was first detected in amniotic fluid by Gitlin and Boesman (1966). It is also detectable in foetal serum from very early pregnancy. Its concentration in foetal serum shows a direct relationship to that in amniotic fluid. It is detectable in liquor amnii in early weeks of pregnancy, and reaches the peak of about 30 μgm per cc. at 14th week of gestation, after which it falls rapidly becoming almost undetectable near term (Seppala and Rueslanti, 1973).

Raised, levels of A.F.P. are seen in foetal neural tube defects, and also in several other foetal malformations e.g. oesophageal atresia and congenital nephrosis (Seppala and Rueslanti, 1972; Kleijir *et al*, 1978). Occasionally, cases of Rh-incompatibility and foetal distress are also reported to have high levels of A.F.P. in amniotic fluid (Guibande *et al* (1973). Ishigura (1973) has found raised A.F.P. levels in cases of multiple pregnancies.

The present work is undertaken to assess the A.F.P. levels in liquor amnii at different periods of normal pregnancies and in pregnancies complicated with foetal malformations. Some abnormal obstetrical conditions e.g. diabetes mellitus, Rh-incompatibility, multiple pregnancies and foetal distress have also been studied.

Materials and Method

The cases for study were selected from antenatal clinic, Family Planning Clinic and labour ward of Hopsital for Women, Patna Medical College Hospital, Patna. A total of 85 cases, out of which 50 normal and 35 abnormal were studied.

Samples in early weeks of gestation were collected by trans-abdominal amniocentesis from those seeking M.T.P. In third trimester pregnancies, transvaginal, transabdominal amniocentesis was adopt-

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ed for collection of liquor amnii. The samples contaminated with blood were discarded. The collected samples were centrifused, the supernatant decanted off and preserved with sodium-azide.

A.F.P. was estimated by radio-immuno-diffusion technique. (Mancini *et al*, 1965) using M- partigen A.F.P. plates (Fig. 1) and standard, supplied by Behringwerk, W. Germany. The known amount (5 ml.) of samples and standard were filled into the wells, and after 48 hours A.F.P. in samples were quantified by measuring the diameters of the precipitine rings formed around the wells (Fig. 1).

Observations

The analysis of cases studied and their results obtained were as follows:

This Table shows highest level of A.F.P. at 13-14 weeks gestation.

In the above Table A.F.P. was not detected at 37-42 weeks in 23, out of 27 cases studied. One case of triplet and 1 case of I.U.D. showed significant rise.

TABLE I

A.F.P. Concentration (Microgram/ml) in Amniotic Fluid in 50 Cases of Normal Pregnancies at Different Periods of Gestation, Analysed at Two Weekly Interval

Period of gestation in weeks	No. of cases	Level of AFP	Mean	S.D.±
0 - 12	4	17-24	20.25	2.48
13 - 14	6	24-40	36.66	7.78
15 - 16	5	11-24	19.2	5.45
17 - 18	4	12-24	17.00	6.00
19 - 20	8	8.24	15.25	6.94
21 - 22	5	8-11	9.4	1.46
23 - 24	3	0-6	2.66	4.62
25 - 26	2	0-6	3.00	4.24
27 - 42	13	N.D.	—	—

ND:—Not detectable.

TABLE II

AFP Concentration (microgram/ml) in Amniotic Fluid in 8 Cases of Neural Tube Defect

Neural tube defects	No. of cases	Gestational age in weeks	AFP concentration (microgram/ml)
(1) Anencephaly and spina bifida	3	(i) 13-14	370.00
		(ii) 31-32	57.00
		(iii) 33-34	60.00
(2) Anencephaly, spinabifida and emphalocele	2	(i) 27-28	159.00
		(ii) 35-36	48.00
(3) Spina bifida	1	37-42	40.00
(4) Thoracolumber meningocele	1	37-42	40.00
(5) Cervical meningocele	1	37-42	24.00

(a) In all the above cases AFP concentration shows a marked increase.
(b) The maximum level seen in first cases at 14th week of gestation in cases of Anencephaly and spina bifida.

TABLE III
AFP Level in 27 Cases of Complicated Pregnancies

Type of pregnancy	No. of cases	Gestational age in weeks	AFP concentration (microgram per ml.)
Diabetes mellitus	3	37-42	N.D.
Hydramnios	3	37-42	N.D.
Rh-incompatibility	5	37-42	N.D.
Foetal distress	6	37-42	N.D.
Twin	5	37-42	N.D.
Triplet	1	37-42	24.00
Intra-uterine death	4	29-30	40.00
		37-42	9.00
		37-42	6.00
		37-42	N.D.

Discussion

Present work consists of the study of normal cases in different periods of gestation, and of abnormal obstetrical conditions mostly in 3rd trimester. A two weekly A.F.P. analysis in amniotic fluid revealed that at 13-14 weeks of gestation the levels were highest. Thereafter it showed a consistent decline and after 26th week it was not detectable by radio-immuno-diffusion technique, whose lower limit of sensitivity is 2.3 microgram/ml.

A.F.P. levels are found to be abnormally high in all cases of neural tube defects. The maximum level in our series was 370.00 microgram/ml. from a case of anencephaly with spina bifida at 14th week of gestation who had come for M.T.P. and sterilization.

All the cases of abnormal pregnancies were in 3rd trimester out of which 1 case of multiple pregnancy and 1 case of I.U.D. showed significantly high levels of A.F.P. concentration. No conclusion can however, be derived by the study of two cases only.

Conclusion

Alpha-foeto-protein is an important biochemical marker in detecting neural tube defect in early pregnancy. Where the previous history is suggestive of this. Medical termination of pregnancy can be done to minimise the risk of physical and mental trauma to the mother.

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See Figs. on Art Paper II