

MATERNAL SERUM ALPHA FOETOPROTEIN LEVELS IN NORMAL PREGNANCY AND VARIOUS TYPES OF ABORTIONS

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SUMMARY

Maternal serum AFP was estimated in 18 cases of normal pregnancy and 36 cases of various types of abortions and vesicular mole. In normal pregnancy AFP started rising from 8th week of pregnancy, reached highest level between 28-30 weeks and then declined gradually till term. In threatened abortion there was no rise of AFP in first trimester but it was significantly raised in 2nd trimester while the levels were almost double of the usual pregnancy level in cases of inevitable abortion even in 1st trimester. Hence, elevated AFP level in 1st trimester is more indicative of inevitable abortion while elevated 2nd trimester AFP level may be indicative of both threatened as well as inevitable abortion. In case of complete abortion AFP was significantly raised. In cases of habitual abortion it was raised where cause was foetal in origin and not incompetent cervical os. In cases of missed abortion and vesicular mole AFP level was that of non-pregnant level because AFP is of foetal origin. About 90% of women showed aberrantly high or low AFP levels eventually aborted.

Introduction

AFP is an embryonic alpha globulin with immunosuppressive properties which is structurally similar to albumin and it is specific to the foetus. It is the first major protein component to appear in foetal serum. AFP levels have been evaluated in foetal serum, amniotic fluid and in maternal serum. The concentration gradient

ranges from mg/ml in maternal serum. In foetus its concentration is low during first 10 weeks of gestation, rises to highest level from about 10th to 20th weeks and decreases thereafter. These changes could arise either from difference in the total amount of foetal protein synthesised or from a disproportionate rate of the foetal growth in relation to relative increase in the synthesis of alpha globulin. However, AFP definitely appears to be concerned with the growth of embryo. We in this

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Accepted for publication on 28/9/1990.*

study have estimated the level of AFP in maternal serum in various types of abortions.

Materials and Method

Subjects included 18 cases of normal pregnancy in whom there was no history of pre-eclampsia, diabetes, multiple pregnancy or delivery of a baby with congenital anomalies in previous pregnancy and in present pregnancy also there was no evidence of abortion, pre-eclampsia, multiple pregnancy, foetal distress and IUD. These 18 cases were taken as controls. The study group included 36 patients who gave history suggestive of threatened, inevitable, complete, habitual, missed abortion or vesicular mole. The diagnosis was confirmed clinically and if needed by ultrasound. Necessary investigations were done.

Quantitative immunological determination of AFP by means of a single radial immunodiffusion was done with the help of a reference curve plotted by using AFP standard curve, M-partigen immunodiffusion plates which contain monospecific antiserum to the plasma protein AFP in an agar gel layer, were used. Technique used was that of Mancini (1965).

Observation and Discussion

Mean age of patient in control subjects was 27.3 and 28.2 years respectively. 15% of the cases were primigravida and 85% were multigravida. Seppala and Rouslahiti (1973a) and Getlin (1975) have also reported similar findings.

AFP in maternal serum started rising from 8th weeks onwards upto 30 weeks pregnancy after which it declined slowly till term (Table II). According to Garoff &

TABLE - I
SHOWING RING DIAMETER IN DIFFERENT DILUTIONS OF STANDARD (HUMAN)
AND AFP CONCENTRATION IN THESE DILUTIONS

Well No.	Standard dilution	Ring Diam in mm	Ring Diam in mm	AFP ng/ml
1.	1:4	1.6	2.8	50
2.	1:2	4	16	500
3.	1:1	5.6	31.8	1050

TABLE - II
SHOWING MATERNAL SERUM CONCENTRATION IN NORMAL PREGNANCY

Period of Gestation in weeks	No. of patients	AFP level ng/ml Range	Mean	SD ±
6 - 12	3	75.2 - 95.6	81.2	10.2
13 - 18	3	158.2 - 210.9	163.2	36.8
19 - 24	3	175.1 - 210.6	195.5	14.7
25 - 30	3	248.0 - 390.4	306.2	61.6
31 - 36	3	239.4 - 325.1	271.2	38.0
37 - 40	3	230.7 - 259.3	246.3	11.8

Sappala 1973), Ishiguro (1973), Wald et al (1975), Brock 1976, Getlin (1975), the origin and regulation of AFP depends on the rate of synthesis and catabolism of AFP by the foetus, change in the permeability of foetomaternal barrier, the volume of body fluids, disturbance in the circulation of body fluids and Foetomaternal transfusion. Fall of AFP during last week of pregnancy is due to its acceleration of degradation during this period (Massey et al 1975).

AFP level in inevitable abortion in Ist trimester is significantly higher than normal pregnancy ($P < 0.001$). In IInd trimester it is significantly higher in both threatened as well as inevitable abortion

(Threatened $p < 0.05$, Inevitable $p < 0.001$). But AFP level in threatened abortion in Ist trimester was not significantly different from normal pregnancy (Table IV). Our findings are in confirmity with those of Seppala and Rouslahiti (1972) and Cowchock et al (1975). Thereafter, it is clear that elevated maternal serum AFP level in the Ist trimester is more indicative of inevitable abortion whereas elevated IInd trimester AFP level may indicate both threatened as well as inevitable abortions.

AFP levels in complete and habitual abortion both are significantly higher in Ist as well as in IInd trimester (Table V), Seppala (1972), Kiessler et al (1977)

TABLE - III
SHOWING AFP LEVEL NG/ML IN DIFFERENT TYPES OF ABORTIONS
ACCORDING TO VARIOUS GESTATIONAL AGE GROUPS

Period of Gestation in weeks	Threatened abortion		Inevitable abortion		Complete abortion		Habitual abortion		Missed abortion		Vesicular mole	
	No. of pts.	AFP level	No. of pts.	AFP level	No. of pts.	AFP level	No. of pts.	AFP level	No. of pts.	AFP level	No. of pts.	AFP level
6 - 12		72.8		131.8						24.0		
	5	95.6	5	152.4					2	28.0		
13 - 18		230.6		340.2		416.6	2	235.3		62.6	2	23.5-39.5
	4	256.2	4	380.9	2	427.6		257.0	2	69.9		
19 - 24						422.9	2	285.0			3	23.3-29.3
					3	482.2		298.9				

TABLE - IV
SHOWING AFP LEVELS IN NORMAL PREGNANCY, THREATENED
ABORTION AND INEVITABLE ABORTION

Period of Gestation in weeks	Gp of patients	No. of patients	AFP level ng/ml range	Mean	S.D. \pm
6 - 12	Normal pregnancy	3	75.2 - 96.6	81.2	10.2
	Threatened abortion	5	72.8 - 95.6	85.13	5.5
	Inevitable abortion	5	131.8 - 152.4	141.6	7.3
13 - 18	Normal pregnancy	3	158.2 - 210.9	163.2	36.8
	Threatened abortion	4	230.6 - 256.2	242.7	10.3
	Inevitable abortion	4	340.2 - 380.9	360.9	14.3

TABLE - V
SHOWING AFP LEVELS IN NORMAL PREGNANCY,
COMPLETE ABORTION AND HABITUAL ABORTION

Gestation in weeks	Gps. of patients	No. of patients	AFP level ng/ml range	Mean	S.D. \pm
13 - 18	Normal pregnancy	3	158.2 - 210.9	163.2	36.8
	Complete abortion	2	416.6 - 427.6	422.6	5.5
	Habitual abortion	2	235.3 - 257.0	246.3	10.8
19 - 24	Normal pregnancy	3	175.1 - 210.6	195.5	14.7
	Complete abortion	3	422.4 - 482.2	455.1	24.1
	Habitual abortion	2	285.0 - 298.4	292.1	6.7

pointed out that women with cervical incompetence often experience habitual abortion during the IInd trimester and that AFP determination in these women before the encirclage operation, as well as subsequent to it may be distinguished between foetal and maternal causes of abortions. Those cases of habitual abortion where an increase in maternal serum AFP was observed were more likely to be due to foetal cause rather than cervical incompetence. Out of 4 cases of habitual abortion there was only one case of cervical incompetence in our study.

AFP levels in missed abortion and vesicular mole were significantly lower as compared to normal pregnancy. Urine for pregnancy test was done. It was negative in missed abortion, positive upto higher dilutions in cases of vesicular mole. Non-pregnant levels of AFP with the simultaneous presence of increased H.C.G., level would be diagnostic of vesicular mole.

Lidbjork et al (1977) have demonstrated that there is strong correlation between aberrantly high or low AFP levels and impending abortions. Among those who exhibited abnormal AFP levels more

TABLE - VI
SHOWING MATERNAL SERUM AFP LEVEL IN NORMAL PREGNANCY,
MISSED ABORTION AND VESICULAR MOLE

Period of gestation in weeks	Gp. of cases	No. of patients	AFP level range	Mean	S.D. \pm
6 - 12	Normal pregnancy	3	75.2 - 95.6	81.2	10.2
	Missed abortion	4	24.0 - 28.0	26.0	2.2
13 - 18	Normal pregnancy	3	158.2 - 210.9	163.2	36.8
	Missed abortion	2	62.0 - 69.4	66.0	3.3
	Vesicular mole	2	23.5 - 34.5	30.0	4.5
19 - 24	Normal pregnancy	3	175.1 - 210.6	195.5	14.7
	Vesicular mole	3	23.3 - 29.3	26.6	2.46

than 90% aborted eventually. We have also observed the same trend in our study.

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The primary factor in fetal loss is the presence of a chromosomal abnormality. In our study, 10% of the abortions were associated with chromosomal abnormalities. This is in agreement with other studies which have shown that 10-15% of spontaneous abortions are due to chromosomal abnormalities. The most common abnormality found was trisomy 16, which is usually lethal in utero. Other abnormalities included trisomy 13, 18, and 21, and monosomy X.

It is interesting to note that the majority of chromosomally normal abortions occur in the first trimester. This suggests that the majority of fetal losses are due to early developmental defects. The fact that 90% of chromosomally normal abortions eventually abort suggests that the fetus is not viable.

The majority of fetal losses occur in the first trimester. This is in agreement with other studies which have shown that 80-90% of spontaneous abortions occur in the first trimester. The fact that 90% of chromosomally normal abortions eventually abort suggests that the fetus is not viable.

The presence of chromosomal abnormalities in the fetus is usually associated with a high rate of fetal loss. In our study, 10% of the abortions were associated with chromosomal abnormalities. This is in agreement with other studies which have shown that 10-15% of spontaneous abortions are due to chromosomal abnormalities.

TABLE I
CHROMOSOMAL ABNORMALITIES IN FETUSES FROM SPONTANEOUS ABORTIONS

Chromosome	Number of cases	Percentage of total	Sex	Survival	Notes
Trisomy 16	10	10.0	5 M, 5 F	0	Usually lethal in utero
Trisomy 13	2	2.0	1 M, 1 F	0	Usually lethal in utero
Trisomy 18	1	1.0	1 F	0	Usually lethal in utero
Trisomy 21	1	1.0	1 M	0	Usually lethal in utero
Monosomy X	1	1.0	1 F	0	Usually lethal in utero
Normal	89	89.0	45 M, 44 F	0	Eventually aborts
Total	103	100.0	50 M, 53 F	0	