SERUM CAP LEVELS AS A PARAMETER OF FETAL WELL BEING IN TOXAEMIA OF PREGNANCY

By

V. K. SINGH, P. ROHATGI, M. K. SHARMA AND M. AGARWAL

SUMMARY

Serum cystine aminopeptidase (CAP) level was determined in 172 samples from control group and 174 samples from patients presenting with varying severity of toxaemias of pregnancy between 28 to 41 weeks of gestation. In the control group a progressive rise in enzyme levels was seen with advancing period of gestation. Maximum being at term. In patients with toxaemia of pregnancy CAP levels were found to be subnormal due to placental insufficiency, specially so, in cases where the fetal outcome was unfavourable.

Introduction

Pregnancy plasma contains an enzyme oxytocinase which inactivates the oxytocin. It is a cystine aminopeptidase. The major source of cystine aminopeptidase is syncytiotrophoblast and from there it diffuses into maternal circulation. It's concentration in serum increases as the gestation advances. Complications associated with placental dysfunction are well reflected by alteration in serum CAP levels and as such it is being introduced as a parameter to assess fetoplacental unit.

Assessment of serum CAP activity has been found to be simple, sensitive and reproducible method for calculating the risk of pregnancy.

Various workers have shown low levels of serum CAP in cases of toxaemia of pregnancy (Josephides and Turkington (1967), Babuna and Yenen (1966), Carter *et al* (1974) and Spellacy *et al* (1977)).

In the present study we have estimated the levels of serum CAP to determine fetal outcome in varying degree of toxaemia of pregnancy.

Material and Methods

We selected our patients from antenatal clinics and indoor wards of UISE Maternity Hospital, Kanpur. Sixty five normal healthy pregnancy women (172 samples obtained from them) were taken as controls and 30 pregnant women with varying degree of toxaemia of pregnancy (174 samples obtained from them) as subjects. The blood samples were collected between 28-41 weeks of gestation. Twelve of them had mild PET, 17 had severe PET and only 1 had eclampsia.

Serum cystine aminopeptidase was measured spectrophotometrically by the method of Christenson and Hagelid (1975). The enzyme activity was calculated in IU/L in serum.

From: G.S.V.M. Medical College, Kanpur.
Accepted for publication on 23-3-89.

Observations and Results

Table I shows mean values of serum CAP levels in IU/L and standard deviation in normal pregnant patients from 28-41 weeks of gestation. There is a progressive rise in serum CAP levels with advancing period of gestation. Since all the patients did not turn up for weekly follow up the number of samples in each week is different.

TABLE I
Serum CAP Levels in Controls (IU/L)

Weeks of gestation	No of samples	Mean	Standard deviation
28-29	20	5.6	± 1.7
30-31	22	8.2	± 2.0
32-33	27	10.0	± 1.8
34-35	24	12.6	± 1.9
36-37	25	14.8	± 2.4
38-39	28	16.2	± 3.0
40-41	26	18.0	± 3.9

Table II shows mean values of serum CAP levels in IU/L and standard deviation in patients of toxaemia of pregnancy from 28 to 41 weeks of gestation.

It is seen that mean serum CAP value in cases of toxaemia of pregnancy is lower as compared to mean values in normal pregnant cases in each gestational age group.

Table III shows outcome of pregnancy in 30 toxaemia patients in relation to period of gestation. Out of the 30 cases of toxaemia of pregnancy, 25 delivered live born and 5 delivered still born babies. Out of 25 patients delivering live babies, 19 (63.3%) delivered normal babies at term and 6 (20.0%) delivered prematurely. Of the 5 still births 2 (6.7%) were premature and 3 (10%) were full term still births. In 19 patients delivering at term, 11 (36.6%) had only mild pre-eclamptic toxaemia and 8 (26.7%) had severe PET. In 5 patients with still births, 2 had severe PET (BP persisting higher than 160/120 mm of Hg with proteinuria (0.3 gm/L) and 2 had pre-eclampsia with abruptio placenta, 1 developed eclampsia at term. None of these 5 patients turned up for weekly follow up.

Table IV shows outcome of pregnancy in relation to serum CAP levels in 30 cases of toxaemia of pregnancy. In 20 (66.7%) patients the serum CAP levels were subnormal as compared to mean

TABLE II
Serum CAP Levels in Toxaemias of Pregnancy (IU/L)

Wks. of gestation	No. of samples	Mean	Standard deviation
28-29	28	4.8	± 1.9
30-31	27	6.8	± 2.4
32-33	24	8.8	± 2.8
34-35	26	10.6	± 2.6
36-37	24	12.5	± 3.0
38-39	23	13.5	± 2.5
40-41	22	14.8	± 3.9

TABLE III
Outcome of Pregnancy in Toxaemia Cases

S. No.	Outcome of pregnancy	Total	Percentage
1.	Full term normal delivery	19	63.3
2.	Premature live birth	6	20.0
3.	Premature still birth	2	6.7
4.	Full term still birth	3	10.0

suggested fetal jeopardy and intrauterine death of 1 baby.

Table V shows gestational periodwise comparison of normal pregnant patients with toxaemic patients in relation to serum CAP levels in IU/L. The values show statistically significant fall ($p < 0.05$) from 28 to 33 weeks of gestation and highly significant fall ($p < 0.01$) from 36 to 41 weeks of gestation in cases of toxaemia of pregnancy as compared to control group.

TABLE IV
Outcome of Pregnancy in Toxaemia Cases in Relation to CAP Levels

Outcome of pregnancy	Serum CAP level within normal limit	Serum CAP levels below normal limit
1. Full term normal delivery	6	13
2. Premature live birth	3	3
3. Premature still birth	1	2
4. Full term still birth	—	2
Total	10 (33.3%)	20 (66.7%)

values in normal pregnancy and in 10 (33.3%) patients the values of serum CAP were within normal limits. These 10 patients were having only mild pre-eclamptic toxaemic and their mean CAP levels were in the lower range of normal, statistically not significant as compared to control group.

In 17 cases of severe PET and 1 of eclampsia the levels were significantly low, specially in the last 4 weeks of gestation. These were 14.8±3.9 IU/L at term in severe PET as compared to 18.0±3.9 IU/L in normal pregnant patients. All these cases showed placental degeneration and infarction. In these cases the level of CAP was subnormal but showed a steady rise. The fetal outcome was favourable. Babies were dysmature in most of the cases. Sudden fall or continuously decreasing serum CAP values

Discussion

Serial CAP estimations done in 65 normal pregnant women showed a progressive rise in enzyme activity with advancing period of gestation reaching maximum level at term.

Babuna and Yenen (1966) using chemical method assay have demonstrated that in normal pregnancy serum oxytocinase activity starts rising at about the beginning of the 4th month and the highest value is reached around term. Riad (1962), Josephide and Turkington (1967), Malkani *et al* (1971), and Shahani *et al* (1979) have also observed progressive rise in CAP levels with advancing gestational period.

The significantly low levels of serum CAP observed by us in severe pre-eclamptic toxaemia and eclampsia specially in the last 4-6 weeks of pregnancy

TABLE V

Cap Levels in Normal and Toxaemia Patients According to Period of Gestation

	Gestation in weeks																			
	28-29		30-31		32-33		34-35		36-37		38-39		40-41							
	N	T	N	T	N	T	N	T	N	T	N	T	N	T						
No. of samples	20	28	22	27	27	24	24	26	26	24	28	23	26	22						
Mean	5.6	4.8	8.2	6.8	10.0	8.8	12.6	10.6	14.8	12.5	16.2	13.5	18.0	14.8						
S.D.	1.7	1.9	2.0	2.4	1.8	2.8	1.9	2.6	2.4	3.0	3.0	2.5	3.9	3.9						
SE	0.532		0.6405		0.589		0.6486		0.8097		0.7841		1.129							
't'	2.064*		2.186*		2.037*		3.083*		2.840**		3.443**		2.832**							
D.F.	46		47		49		48		47		49		48							

N—Normal T—Toxaemic *—Significant at ($p < .05$) **—Significant at ($p < .01$)

as compared to the control group (the value being 14.8±3.8 IU/L at term in severe PET, and 18.0±3.9 IU/L in control P value < 0.01) have been confirmed by Josephides and Turkington (1967). They noted that there was no distinct effect on the level of serum CAP in mild toxaemia and uncomplicated hypertension but in severe toxaemia and eclampsia the levels of CAP were below the limit of normal controls. We observed placental degeneration and infarction in only those cases of severe toxaemia where the fetal outcome was unfavourable.

Riad (1962, Babuna and Yenen (1960), Malkani *et al* (1977) and Shahani *et al* (1976) also observed low values of serum CAP in patients with toxaemia of pregnancy.

Conclusion

1. Determination of serum CAP levels is an easy, quick and accurate method for monitoring the well being of fetus specially in high risk pregnancies.

2. Serum CAP levels show a progressive rise with advancing period of gestation in normal patients reaching maximum levels at term viz. 18.0±3.9 IU/L.

3. In cases of toxaemia where there is placental degeneration and infarction, subnormal values of serum CAP levels are seen, specially so in last 4 weeks, being 14.8±3.9 IU/L at term.

4. With subnormal but steadily increasing serum CAP levels the fetus is not at imminent risk.

5. Continuously decreasing serum CAP value or a sudden fall in levels suggest imminent fetal risk or intrauterine death of fetus.

References

1. Babuna, C. and Yenen, E.: J. Obstet. Gynec. 94: 868, 1966.
2. Carter, E. R., Goodman, L. V., Dethaan, R. M. and Sobota, J. T.: J. Obstet. Gynec. 119: 76, 1974.
3. Christenson, A. and Hagelid, P. E.: Acta Endocr. 78: 364, 1975.
4. Josephides, E. G. H. and Turkington, V. E.: J. Obstet. Gynec. Brit. C'wealth. 74: 258, 1967.
5. Malkani, P. K., Singh, P. and Narula R. K.: J. Obstet. Gynaec. India, 21: 7 1971.
6. Riad, A. M.: J. Obstet. Gynec. Brit. Emp. 69: 409, 1962.
7. Shahani, S. M., Merchant, P. C. and Dandia, M. M.: J. Obstet. Gynaec. India, 27: 276, 1977.
8. Spellacy, W. N., Gomoz, M. U. and De castro, A. P.: Am. J. Obstet. Gynec. 127: 10, 1977.