PLATELET DISTRIBUTION WIDTH IN NORMAL PREGNANCY

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SUMMARY

Normal pregnancy is compensated state of subclinical coagulopathy. Platelets play major role in blood coagulation and information regarding behaviour of platelets in normal pregnancy has shown varying trends. Recently the introduction of automatic analyzer has made it possible to assess platelet distribution width (PDW) besides platelet counts (PC) and mean platelet volume (MPV). 35 cases of normal pregnancy attending the O.P.D. in Department of Obstetric and Gynae, M.A.M.C. and L.N.J.P.N. Hospital were assessed serially at monthly interval from 20 weeks of pregnancy to 40 weeks for these platelet indices by automated quantitative analyzer sysmex TMK 1000 and the findigns were compared with control (6 weeks postpartum readings. Platelet count decreases in normal pregnancy significantly when compared to control from 20-24 weeks ($p < .002$) and the fall continues till 40 weeks ($p < .001$) but if monthly readings are compared with each other serially the fall is not significant. M.P.V. increases in pregnancy but not significantly. P.D.W. shows steady rise throughout pregnancy from 24-28 weeks ($p < .003$) to 36-40 weeks ($p < .001$) versus control and if monthly readings are compared serially then significant rise in P.D.W. is there at 32-36 weeks ($p < 0.010$) and 36-40 weeks ($p < 0.02$). Platelet count does not show significant fall in serial monthly readings at this time. P.D.W. is a more sensitive index in detecting the changes in platelet indices.

INTRODUCTION

Ever since Virchow (1986) postulated hypercoagulability as one of triad of etiological factors in thromboembolic states, numerous attempts have been made to demonstrate abnormalities in clotting factors in such conditions. These changes together with elevated fibrinogen retarded blood flow in legs and increased platelet adhesiveness provide a dangerous hypercoagulable state that can

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readily be trigerred into intravascular coagulation by minute amounts of thromboembolic element liberated into circulation from gravid uterus or elsewhere.

Pregnancy is associated with complex and still incompletely understood changes involving blood coagulation. Platelets play major role in blood coagulation and information regarding behaviour of platelets in normal pregnancy has shown varying trends prior to introduction of automatic analyzer. Some show decrease in platelet count, some show increase while some others show no change. Even automation has not clarified the matter, though there is no report showing increase in platelet count.

In 1983, et al Fay conducted studies in platelet count, mean platelet volume and platelet distribution width in normal pregnancy. In his study there was significant fall in platelet count in last eight weeks, significant rise in platelet volume in last 4 weeks while platelet distribution width rose constantly and significantly throughout pregnancy. These findings indicate increased platelet consumption throughout normal pregnancy and platelet distribution width (P.D.W.) appears to be more sensitive measure of macrothrombocytosis in pregnancy. P.D.W. is the arithmatic distribution width measured at the 20% relative height level taking measured at the 20% relative height level taking the histogram peak as 100%. It is an index of range the histo gram peak as 100%. It is an index of range of volume distribution of the platelet population mathematically extrapolated for best fit.

MATERIALS AND METHODS

Study of platelet indices in normal pregnancy was conducted in the Department of Obstetrics and Gynaecology, M.A.M.C. and L.N.J.P.N. Hospital, Delhi, during the period August 1990 to June 1991 to define serial changes in platelet indices during normal pregnancy and to compare them to normal nonpregnant levels.

Normal pregnancy cases (n = 35) attending antenatal clinic and postnatal clinic with Hb above 10 gm% and singleton gestation between 20 to 40 weeks estimted clinically were included in the study. Patients were followed till 6 weeks after delivery. Nonpregnant female staff (n = 18) working in the department who had normal blood pressure and Hb above 10 gm/dl. were taken as control.

After history taking, general physical and systemic examination was done to exclude abnormality and to confirm normal singleton pregnancy.

2 ml of whole blood was drawn by antecubital venepuncture and collected in vial containing E.D.T.A. in concentration of 1 mg/ml of blood. Sample was taken at first visit and at monthly intervals and 6 weeks after delivery. Samples collected were analysed in 6 hours to 24 hours in a fully automated quantitative analyzer sysmex T.M.K. 1000. Samples if not analysed same day were kept in refrigerator at 2° to 4° c and analysed in 24 hours. T.M.K. 1000 consists of a main unit, pneumatic unit and a PDA (particle distribution analysis) unit model KPU - I. Platelet count (P.c.), mean platelet volume (MPV) and platelet distribution width (PDW) was studied in the sample.

OBSERVATIONS

Table I shows platelet count (PC), mean platelet volume (MPV) and platelet distribution width (PDW) in normal pregnancy cases 6 weeks after delivery and nonpregnant controls. There is no statistically significant variation in these two groups and so platelet indices postpartum were taken as control for the same patient. Platelet count decreases in normal pregnancy significantly when compared to control (Table II) from 20-24 weeks

($p < 0.002$) and significant fall continues till 40 weeks ($p < 0.001$) but if monthly readings are compared with each other serially, fall is not significant.

M.P.V. increases in pregnancy but not significantly (Table III).

P.D.W. shows steady rise throughout pregnancy from 24-28 weeks ($p < 0.003$) to 36-40 weeks ($p < 0.001$) versus control and if monthly readings are compared serially then significant rise in P.D.W. is there at 32-36 weeks ($p < 0.01$) and 36-40 weeks ($p < 0.02$) (Table IV). Platelet count does not show significant fall in serial monthly reading at this

Table I

Platelent indices in 6 weeks postpartum (PP) versus non-pregnant control (NPC)

	Platelet count x 103 μL		Platelet volume in FL		Platelet distribution width in FL	
	Postpartum	NPC	PP	NPC	PP	NPC
Range	162 - 446	133 - 504	7.2 - 11.3	8 - 11.5	8.4 - 15.7	9.5 - 15.5
Mean	284.69	265.61	986	10.14	12.48	12.89
SD	73.97	79.52	6.75	0.96	1.76	1.66
Significance using Student's test.	No significant ($p > 0.05$)		No significant ($p > 0.05$)		Not significant ($p > 0.05$)	

Table II

Platelet Count (103 μL) in normal Pregnancy
n = 35

	a	b	c	d	e	
Weeks in pregnancy	20 - 24	24 - 28	28 - 32	32 - 36	36 - 40	PP*
Range	155-304	146-321	135-345	120-355	104-361	162-446
Mean	239	224	225	230	226	284.69
SD	56.75	49.98	49.79	55.62	59.14	73.97

Significance		
	a vs. PP significant ($p < 0.02$)	a vs. b not significant ($p > 0.05$)
	b vs. PP significant ($p < 0.001$)	b vs. c not significant ($p > 0.05$)
	c vs. PP significant ($p < 0.001$)	c vs. d not significant ($p > 0.05$)
	d vs. PP significant ($p < 0.001$)	d vs. e not significant ($p > 0.05$)

* PP means Postpartum

Table III

Mean Platelet Volume (fl) in Normal Pregnancy
n = 35

Weeks in pregnancy	a 20 - 24	b 24 - 28	c 28 - 32	d 32 - 36	e 36 - 40	PP*
Range	8.4-12.5	8.7-13.4	7.7-13.6	8.5-14	7.814.2	7.2-11.3
Mean	10.38	10.52	10.53	10.91	11.19	9.86
SD	1.87	1.24	1.19	1.13	1.26	6.75
Significance	a vs. PP not significant ($p < 0.05$)			a vs. b not significant ($p > 0.05$)		
	b vs. PP not significant ($p < 0.05$)			b vs. c not significant ($p > 0.05$)		
	c vs. PP not significant ($p < 0.05$)			c vs. d not significant ($p > 0.05$)		
	d vs. PP not significant ($p < 0.05$)			d vs. e not significant ($p > 0.05$)		

* PP means Postpartum

Table IV

Platelet Distribution Width (fl) in Normal Pregnancy
n = 35

Weeks in pregnancy	a 20 - 24	b 24 - 28	c 28 - 32	d 32 - 36	e 36 - 40	PP*
Range	9.5-19.4	10.9-24.1	9.2-23	10-24.1	9.7-25	8.4-15.7
Mean	14	14.39	14.34	15.27	15.88	12.48
SD	4.15	3.21	2.91	3.1	3.11	1.76
Significance	a vs. PP not significant ($p < 0.05$)			a vs. b not significant ($p > 0.05$)		
	b vs. PP not significant ($p < 0.05$)			b vs. c not significant ($p > 0.05$)		
	c vs. PP not significant ($p < 0.05$)			c vs. d not significant ($p > 0.05$)		
	d vs. PP not significant ($p < 0.05$)			d vs. e not significant ($p > 0.05$)		

* PP means Postpartum

time. It shows that P.D.W. is more sensitive index in detecting the changes in platelet indices.

DISCUSSION

In this study platelet counts in normal pregnancy showed no significant change if P.C. at monthly interval from 20 to 40 weeks

were compared serially (Table II) but when P.C. of each month were compared with 6 weeks postpartum, there was significant fall at each month and it became more significant as duration of pregnancy increased. Decrease in platelet count has been reported by Sejeny et al (1975), O'Brien (1976), Cairns et al (1977), Pitkin (1979), Fay et al (1983) and Tygart (1986). No significant change was reported by Ratnoff (1954), Fresh (1956) and Fenton (1977). Increase in platelet count was reported by Benhamou and Nouchy (1932) and Mor et al (1960). Increase in these studies may be due to error in visual counting of platelets.

M.P.V. increases in pregnancy but not significantly. This is supported by study of Tygart (1986). Fay et al (1983) reported that M.P.V. increases in last 4 weeks of pregnancy.

PDW increases steadily and significant increase occurs at 32-36 weeks which continues till 40 weeks when monthly readings are compared serially. No significant change in P.C. takes place at this time, thus P.D.W/ is more sensitive in detecting changes in platelet indices. Fay et al (1983) and Tygart (1986) also reported increase in PDW. Rowan et al (1979) suggested that MPV may be an insensitive index of platelet size and that measure of what is happening more peripherally in the volume distribution (i.e. at 20th and 80th Centile) should be a more sensitive indicator of presence of larger platelets in circulation. This is evident in the present study also. Our study is in agreement with longitudinal study of Tygart (1986) who proposed that normal pregnancy is a compensated state of progressive platelet consumption. In normal pregnancy there appears to be platelet destruction as demonstrated by a significant fall in PC and significant rise in PDW as compared to control. These findings are consistant with Mckey's (1964) view of which he postulated that there is chronic intravascular coagulation in normal pregnancy that progressively increases towards term.

It can be inferred that normal pregnancy is compensated state of subclinical coagulopathy.

REFERENCES

1. *Benhamous E, Nouchy A. Gyne et Obster 25 : 97, 1932.*
2. *Cairns JW, Mohan A., Waters Daw, Chanarin I. J. : J. Clin. Pathol , 30 : 392, 1977.*
3. *Fay R.A., Hughes A.O., Farron Nt. Obstet. Gynec. 61 : 238, 1983.*
4. *Fenton V. Saunders K, CAvill I. J. Clin Path 30 : 68, 1977.*
5. *Fresh JW, Ferguson JH, Lewiz JH, Obstet. & Gynec. 7 : 117, 1956.*
6. *Mckay D.G. Circulation 30 : 2, 66, 1964.*
7. *Mckay D.C., Berghar Ela, Maealao De, Sadlis A. Am. J. Obstet. Gynec. 90 (8), 1315, 1964.*
8. *Mor A, Yang W., Schwartz A., Jones W.C., Obstet. and gynec. 16 : 338, 1960.*
9. *O' Brien JR, J. Clin Path 29 : 174, 1976.*
10. *Pitkin RM, Whitte D.L. JAMA 242 : 2696, 1979.*
11. *Ratnoff OD, Colopy JE, Pritchard JA J. Lab. Clin. Med 44 : 408, 1954.*
12. *Rowan R.M., Fraser C., Gray J.H., McDonad G.A., clin Lab Haematol 1 : 19, 1979.*
13. *Sejeny S.A., Eastham RD, Baker S.A., J. lin pathol. 28 : 812, 1975.*
14. *Tycart S.G. Am. J. Obs. & Gynae. 154 : 883, 1986.*
15. *Virchow R., Virchows Arch F., Path. Anat. 103 : 39, 1986.*