A STUDY OF TOTAL PLATELET COUNT, ADHESIVE PLATELET COUNT AND PLATELET ADHESIVENESS IN VARIOUS PHASES OF NORMAL MENSTRUAL CYCLES

by

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The fact that among other changes, menstruation involves bleeding from the blood vessels injured at the shedding of the uterine mucosa has directed special interest to the blood changes which attend the phases of menstrual cycles.

Demonstrable fall in the platelet count at the time of menstruation (Pfeiffer and Hoff, 1929) and the simultaneous lowering of capillary resistance (Henning, 1924) have given rise to the speculation that menstruation is to be regarded as a physiological thrombopenia with a general liability to bleeding as a latent haemorrhagic diathesis.

The correlation of mid-cycle peak elevation of platelet count with the basal temperature shift from lower to higher phase (Peeper and Lindsey, 1956), led to the belief that the former may be more accurate indication of ovulation than the latter.

The occurrence of thromboembolic episodes in 'pill-users' have led to the speculation about the possible role of progestational compounds as its aetiological factors. This observation correlates well with the fact that the platelet count reaches its peak at the time of ovulation and remains at a higher level thereafter till the menstruation.

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Material and Methods

The present study consists of estimation of total platelet count, adhesive platelet count and platelet adhesiveness in 50 normal women varying from 18 to 28 years in age and with regular normal menstrual cycles, from March 1970 to October 1971 at Medical College, Jabalpur. Patients with irregular periods, chronic diseases, bleeding diathesis, diabetes, and with history of drugs affecting blood coagulation were excluded from the present series. The estimations were made on the 2nd, 14th, 21st and 27th day of menstrual cycle.

Observations and Results

Tables I, II, III, IV show the range, mean, standard deviation (S.D.), standard error of mean (SEM) and co-efficient of variation (%CV) of total platelet count adhesive platelet count, and platelet adhesiveness in the first, second, third and fourth weeks of menstrual cycle.

Table V shows the mean of total platelet count, adhesive platelet count, and platelet adhesiveness during each week

TABLE I
Values in First Week of Menstrual Cycle

	Range	Mean	S.D.	S.E.M.	%C.V.
Total platelet count	140,000-250,000	187,000	23030	3257	12.30
Adhesive platelet count	20,000-60,000	42,200	13294	1880	31.50
Platelet adhesiveness	71.4-91.3%	81.68%	5.29	0.74	6.47

TABLE II
Values in Second Week of Menstrual Cycle

	Range	Mean	S.D.	S.E.M.	%C.V.
Total platelet count	180,000-310,000	246,000	35970	5080	14.62
Adhesive platelet count	20,000-80,000	48,200	14650	2782	40.76
Platelet adhesiveness	71.4-93.5%	83.56%	6.20	0.87	7.41

TABLE III
Values in Third Week of Menstrual Cycle

	Range	Mean	S.D.	S.E.M.	% C.V.
Total platelet count	170,000-280,000	216,000	12652	1590	15.84
Adhesive platelet count	30,000-80,000	44,400	13720	1940	30.90
Platelet adhesiveness	76.0-90.3%	83.0%	4.37	0.12	5.26

TABLE IV
Values in Fourth Week of Menstrual Cycle

	Range	Mean	S.D.	S.E.M.	% C.V.
Total platelet count	170,000-270,000	208,000	27700	2350	13.12
Adhesive platelet count	30,000-60,000	44,000	10880	1538	24.72
Platelet adhesiveness	75-90	82.52%	3.74	0.53	4.53

TABLE V
Mean Values During various Weeks of Menstrual Cycle

	I week	II week	III week	IV week
Total platelet count	187,000	246,000	216,000	208,000
Adhesive platelet count	42,200	48,200	44,400	44,000
Platelet adhesiveness	81.68%	83.56%	83.0%	82.52%

of normal menstrual cycle in the present series.

Total platelet count, mean adhesive platelet count and platelet adhesiveness was highest in the second week (14th day of the cycle).

The rise in the total platelet count in the second week over the first week ranged from 10,000 to 15,000, with an average of 598,000. In two cases no rise was noted.

Age had no effect on these values.

Comments

The total platelet count was found to be minimum on the second day of menstrual cycle (i.e., during the menstrual flow). Thereafter, it rose with a peak in the second week, on the 14th day (day

of ovulation). Then it steadily fell in the third and the fourth weeks. But the figures in the premenstrual phase were higher than those during the menstrual flow.

Similar findings were observed by Pfeiffer and Hoff (1929), Henning (1924) Benhamou and Nouchey (1932), Genell (1936) and Savi and Cigada (1957).

Peeper and Lindsey (1956 and 1959) tried to correlate the fluctuations in platelet levels with the basal body temperature records by daily estimations of platelet counts, and found that the platelet peak level occurred during thermal shift or within the following 24 hours in 80-86.6% cases.

Mobius and Johannes (1963) did not note any mid-cycle peak in the levels of platelets in anovulatory cycles. Peeper and Lindsey (1960) noticed that the mid-cycle peak was abolished by giving Enavid.

Adhesive platelet count was highest during the second week of menstrual cycle.

There was no significant difference in the levels of platelet stickiness at any phase of menstrual cycle. Similar findings were noted by Caspary and Peberdy (1965) and McBride and Snodgrass (1968).

Elevations of platelet levels by administration of oestrogens and progesterone (Savi and Cigada, 1957), abolition of platelet rise by oophorectomy or pregnancy (Peeper and Lindsey, 1956) and fall in the platelet levels by castration and ligation in experimental animals (Bankow 1936) suggest a relationship between the platelet levels and the levels of oestrogen and progesterone.

On the other hand, Zondek and Kaatz (1936), Benhamou and Nouchey (1932), and Genell (1936) did not notice any change in the platelet levels by giving oestrogen or progesterone.

Bankow believed that the rise of platelets after menstruation cannot be casually related to increased blood oestrin. Bankow (1936) in an experimental study noticed a fall in the platelet levels after castration or ligation and rise in the levels after implanting the sex glands. He attributed these changes in the platelet levels to disturbance in the equilibrium between the different endocrine organs of the body and not due to diminution or increase of sex hormones per se. Romos (1959) working on virgin female rabbits noted rise in the levels of platelets at the time of ovulation, due, probably, to physiological stress that caused alarm reaction and a subsequent discharge of corticosteroids.

Henning (1924) tried to correlate the blood platelet changes with variations in the sex hormone levels and believed that the fall in the levels of platelets at the onset of menstruation may be related to the fall in level of corpus luteum hormones and parallelism may be said to exist between the oestrin curve and platelet curvve during the menstrual period.

Dawbarn, Erlam and Evans (1928) and Genell (1935) noted that as after an operation, the platelets after parturition and abortion show a general tendency to rise and at the same time the coagulation time shortens slightly.

The period following menstruation coincides with the increase in the blood oestrin and the period after parturition or abortion with a much reduced blood oestrin. Hence, the analogous increase in the platelet levels cannot be related to the follicular hormone. Norman explained the rise in the platelet levels in these conditions by the presence of raw area

in the endometrium from where the resorption of necrotic material takes place till the raw area of endometrium (shed endometrium) is reformed. The postmenstrual increase in the platelet levels is due to the organism's reaction to resorption of necrotic material. The decrease in the platelet levels observed at the onset of menstruation may be due to toxic reaction (menotoxin) or due to an endocrine reaction via the spleen or haemopoietic system.

Thus, the variations in the levels of platelets found at the time of menstruation and ovulation may be explained by variations in the levels of ovarian hormones, menotoxin, and toxic resorption of the necrotic material from raw endometrial surface. Whether the corticosteroids also play a role (as in lower animals) is difficult to evaluate.

Summary

1. The present study is an estimation of total platelet count, adhesive platelet count, and platelet adhesiveness in 50 normal women between the ages of 18-28 years with normal menstrual cycles.

2. The total platelet count was minimum on the second day of menstrual cycle, then it rose to a maximum level on the day of ovulation. Thereafter it decline steadily till the beginning of the next menstrual flow.

3. Adhesive platelet count and platelet adhesiveness were maximum on the day of ovulation, though the variations in their levels at other phases of menstrual cycle were insignificant.

4. The variation in the platelet levels during menstruation and at the time of ovulation may be due to the change in the levels of ovarian hormones, absorption of necrotic material, menotoxin, or due to an endocrine reaction via the spleen on the haemopoietic system.

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