

Platelet counts during normal pregnancy

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SYNOPSIS Eleven reports of platelet counts were found in the literature which reported a progressive increase, no change, or a progressive fall during pregnancy. The counts had been made using venous or capillary blood, with either simple dilution or red cell lysis prior to enumeration in a haemocytometer, with or without phase-contrast microscopy. It was therefore decided to examine whole blood platelet counts taken during normal pregnancy. Results from 405 venous blood samples, using an electronic platelet counter, confirmed the finding of a significant progressive fall in platelet counts during normal pregnancy, the lowest counts falling in some women outside the recognized normal range of values.

In a survey of the literature, there were three reports of an increase in platelet counts during pregnancy (Benhamou and Nouchy, 1932; Mor *et al*, 1960; Rebaudi, 1907). Five groups of workers reported that there was no significant change in the platelet count during pregnancy (Bland *et al*, 1930; Fresh *et al*, 1956; Kennan and Bell, 1957; Ratnoff *et al*, 1954; Todd *et al*, 1965). By way of contrast, there were three reports of a progressive fall in platelet counts during pregnancy (Bonnar *et al*, 1969; Shaper *et al*, 1968; Ward and MacArthur, 1948). There was great variation in the method of blood sampling and platelet counting, and the numbers of counts or patients studied were not large in 10 of these reports.

Following the acquisition of a Coulter Thrombocounter, it was felt that it would be valuable to examine blood counts taken from normal women during their routine attendance at local antenatal clinics, and a total of 405 blood samples were examined.

Methods

Platelet counts were carried out on 405 venous blood samples from normal pregnant women sent from local health centres for routine haematological investigation, using a Coulter Thrombocounter. Red-cell-poor dilutions of platelet suspensions for counting were prepared by a modification of a simple sedimentation method (Eastham, 1965); 0.2 ml whole blood mixed with 1.8 ml Isoton

solution in 75 × 10 mm siliconed tubes were stood for 1 hour, then 0.1 ml of the red-cell-poor supernatant was added to 10 ml Isoton, mixed, and counted in duplicate by means of the Coulter Thrombocounter. Twenty replicate dilutions and counts on a sample of blood gave a mean whole blood platelet count of 167×10^9 per litre with a coefficient of variation of 2.3%.

Results

The results of platelet counts made on blood samples taken during the three trimesters of pregnancy are shown in table I. There is a significant fall in whole blood platelet counts during pregnancy, and

Trimester of Pregnancy	No.	Mean Platelet Count + 10^9 /litre	SD	Highest	Lowest
First	100	210.4	52.3	383.0	137.0
Second	101	203.3	45.8	361.0	96.0
Third	204	183.9	50.3	324.0	75.0

Table I Platelet counts during the three trimesters of pregnancy

Comparison	t	Significance
1st v 2nd	1.06	P > 0.05
1st v 3rd	4.21	P < 0.001
2nd v 3rd	3.32	P < 0.001

Table II Using Student's t test a comparison of the results from three trimesters of pregnancy

especially during the second and third trimesters (table II).

Discussion

Comparison of mean values of platelet counts obtained during normal pregnancy revealed a non significant decrease from the first to second trimesters, and a significant decrease from the second to third trimesters.

From 1907, 11 reports of platelet counts during pregnancy were noted. A variety of methods was used, including the use of either venous or capillary blood, simple dilution of blood or red cell lysis prior to enumeration in haemocytometers. Microscopy was used with or without the aid of phase contrast equipment.

Mor and his colleagues (1960) studied the largest number of patients and found a progressive increase in platelet counts during pregnancy. By contrast, Shaper *et al* (1968), reporting on the second largest number of patients, found a consistent fall in platelet counts during pregnancy. In the remaining nine studies, the number of pregnant women studied was small. In the present series 405 platelet counts were made. With the development of electronic particle-counting machines, platelet counts can now be made rapidly and with good replication. Samama *et al* (1974) compared counts made on diluted blood using microscopy with phase contrast with platelet counts made using a Coulter F_n counter on platelet-rich plasma (Bull *et al*, 1965) and whole blood platelet counts on the Technicon Autoanalyzer machine; they found that there was very close correlation of results by all three methods.

During normal pregnancy the plasma volume increases more than the red cell volume, and this present finding of a progressive decrease in the platelet count during pregnancy could reflect this relative increase in plasma volume, if platelet production remains fairly constant during pregnancy. This might be important in future considerations of the mechanism of control of the circulating platelet count in normal subjects. During long-term oral anticoagulant control it was found that, in the absence of complicating disease, the platelet count in an individual remained fairly constant about a mean value falling within the normal range (Eastham, 1966). Shaper *et al* (1968) found that the packed cell volume gave the indication of the degree of change taking place in the

red cell mass and the plasma volume; they suggest that progressive falls in the platelet count from mid-term to labour indicate a direct relationship between the plasma volume changes and the corresponding platelet counts, plasma volume increasing more than red cell mass. The present findings suggest that in normal women with platelet counts at the lower end of the normal range, their platelet counts might fall below the accepted normal range during normal pregnancy. Whether such counts are of clinical significance is not known. Further studies are in progress to determine normal values throughout normal pregnancy.

References

- *Benhamou, E. and Nouchy, A. (1932). Les plaquettes sanguines au cours de la menstruation, de la grossesse et des suites de couches. *Gynec. et Obstét.*, **25**, 97-110.
- *Bland, P. B., First, A., and Goldstein, L. (1930). The blood-platelets in pregnancy and in the puerperium. *Amer. J. Obstet. Gynec.*, **20**, 165-173.
- Bonnar, J., McNicol, G. P., and Douglas, A. S. (1969). Fibrinolytic enzyme system and pregnancy. *Brit. med. J.*, **3**, 387-389.
- Bull, B. S., Schneiderman, M. A., and Brecher, G. (1965). Platelet counts with the Coulter counter. *Amer. J. clin. Path.*, **44**, 678-688.
- Eastham, R. D. (1966). Adhesive platelets and myocardial infarction. *Geriatrics*, **21**, 182-192.
- Eastham, R. D. (1965). Simple method for separating platelets from red cells before enumeration with an electronic counter. *J. clin. Path.*, **18**, 248-249.
- Fresh, J. W., Ferguson, J. H., and Lewis, J. H. (1956). Blood-clotting studies in parturient women and the newborn. *Obstet. and Gynec.*, **7**, 117-127.
- Kennan, A. L. and Bell, W. N. (1957). Blood coagulation during normal pregnancy, labor, and the puerperium. *Amer. J. Obstet. Gynec.*, **73**, 57-64.
- Mor, A., Yang, W., Schwarz, A., and Jones, W. C. (1960). Platelet counts in pregnancy and labor. *Obstet. and Gynec.*, **16**, 338-342.
- Ratnoff, O. D., Colopy, J. E., and Pritchard, J. A. (1954). The blood-clotting mechanism during normal parturition. *J. Lab. clin. Med.*, **44**, 408-415.
- Rebaudi, S. (1907). Blood platelets during pregnancy, labor, the puerperium and menstruation, and in the newborn. *Amer. J. Obstet.*, **2**, 475-481.
- Samama, M., Capelle, C., and Beuzart, A. (1974). La numération des plaquettes. *Path. et Biol.*, **22**, 515-523.
- Shaper, A. G., Kear, Jill, Macintosh, D. M., Kyober, J., and Njama, D. (1968). *J. Obstet. Gynaec. Brit. Cwlth.* **75**, 433-441.
- Todd, M. E., Thompson, J. H., Jr., Bowie, E. J. W., and Owen, C. A., Jr. (1965). Changes in blood coagulation during pregnancy. *Mayo. Clin. Proc.*, **40**, 370-383.
- Ward, C. V. and MacArthur, J. L. (1948). Blood platelet studies during pregnancy and the puerperium. *Amer. J. Obstet. Gynaec.*, **55**, 600-608.
- *Quoted by Ward and MacArthur (1948).