

VARIATION IN THE FREQUENCY OF DRUMSTICKS IN NEUTROPHILS DURING NORMAL MENSTRUAL CYCLE

by

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From the time immemorial, the maleness or the femaleness of the individual is being decided on the basis of the external anatomical features, physiological functions and psychological behaviours. These criteria of the sex differentiation fail when a state of intersexuality comes in. In such cases of disputed sex, it is essential to define the genetic sex of the individual by demonstrating sex chromatin in the resting cell nuclei or drumstick in peripheral neutrophils.

Davidson and Smith (1954) demonstrated sexual dimorphism in polymorphonuclear neutrophil leucocytes on the basis of an appendage which they called "drumstick". These workers demonstrated that 1 to 2% of the neutrophil leucocytes in the female peripheral blood had this sex specific appendage and their findings were confirmed by Riis (1955), Davidson and Smith (1956), Briggs (1958), Mittwoch (1964) and Raman and Gupta (1967).

Human female exhibits a strange phenomenon of menstrual cycle during the reproductive period of life. Frequen-

cy variation in the incidence of drumstick have been noted by de Castro (1963) in cachectic women. That led to the speculation about the possible role of hormonal fluctuation on the incidence of drumsticks. Reports of Caratzali *et al* (1957) and Caratzali (1963) do not provide sufficient information. It was, therefore, considered worthwhile to study the variation in the frequency incidence of drumstick in polymorphonuclear neutrophil leucocytes during various phases of menstrual cycle.

Material and Method

Thirty-three young females 18 to 25 years of age were selected for this study. Their menstrual history revealed no abnormality as all were having painless normal flow. None of the subjects had ever conceived but exhibited regular menstrual cycles. No attempt was made to determine if there was ovulation or not during the experiment.

The average duration of normal menstrual cycle was taken to be of 28 days which was divided in seven intervals of 4 days each. The first day of the bleeding was taken as first day of the cycle and thus the seven intervals were days 1-4, 5-8, 9-12, 13-16, 17-20, 21-24 and 25-28 respectively. Blood smears were prepared at the beginning of every in-

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terval of the menstrual cycle. However, in each case an extra smear sample was collected at the beginning of the first interval of next cycle and a note was also made for the total length of each cycle.

Air dried blood smear were stained with Wright's stain as usual and drumstick counting was done by the method of Davidson and Smith (*loc. cit.*) using oil immersion and binocular microscope. In each case at least 1000 polymorphonuclear neutrophil leucocytes were screened.

Results

The mean percentage of the drumsticks in polymorphonuclear neutrophil leucocytes in control group recorded was 2.3 ranging from 1.9 to 2.6 per cent with a standard deviation of ± 0.12 . The mean value shows steady rise in percentage upto 4th interval coinciding with the time of ovulation and then starts declining reaching to the control level at the end of seventh interval. With the onset of next cycle the mean percentage value returns to the control level. The statistical analysis shows that there is a significant rise in the percentage of drumsticks on 13th and 17th day of the menstrual cycle i.e. the beginning of the 4th and 5th intervals.

Discussion

Drumsticks of Davidson and Smith are the nuclear formations, appearing more frequently in female polymorphonuclear leucocytes. Being an integral part of the neutrophil nuclei, these appendages are affected by many of the biochemical forces operating in the body. Exogenous as well as endogenous hormones influence the genesis of these bodies to an appreciable extent.

Menstrual cycle is regulated primarily by the ovarian hormones through the hypophyseal activity. Fluctuation of the hormonal level brings about the variation in the frequency of drumsticks (Caratzali, 1963).

The results of present investigation revealed that the drumstick percentage swing on both the sides of the base line during the menstrual cycle. A parabolic relationship was noted between the mean percentage and the time intervals of the cycle. Our line of thinking falls in line with Caratzali *et al* (*loc. cit.*) and it may be that hormonal fluctuations during the menstrual cycle is the possible responsible factor for this numerical variation in the drumstick percentage.

Our study clearly demonstrates that the highest mean percentage of drumsticks was found to occur on 13th day of the menstrual cycle (Table 1). This signi-

TABLE I
Showing mean percentage of drumsticks in polymorphonuclear neutrophil leucocytes during various intervals of menstrual cycle

Days	Mean	Range	S.D. \pm	' + '
1	2.3	1.9—2.6	0.12	..
5	2.8	2.3—3.2	0.11	1.43
9	3.5	3.4—4.4	0.21	1.91
13	5.9	5.2—7.1	0.19	2.36*
17	5.3	4.9—5.6	0.26	2.32*
21	3.2	2.6—3.4	0.15	1.98
25	2.2	1.8—2.5	0.09	0.06
1**	2.1	1.8—2.4	0.11	..

*Significant at 5% level.

**First day of the next menstrual cycle.

ficant increase in the frequency on 13th day corresponds with the time during which ovulation is likely to have occurred. Thus our results do not differ significantly from those of Caratzali *et al* (loc. cit) and Caratzali (1963). Mean value recorded on 17th day is statistically significant and possibly the factors operating during the 4th interval continued further to influence the drumstick percentage. It can be demonstrated that the changes in frequency percentage of drumstick during menstrual cycle is a fact.

We believe that rise in percentage above 3.8 per cent is indicative of proliferative phase and fall below 2.0 per cent suggests the secretory stage of the cycle.

Summary

Peripheral blood smears from thirty-three females having regular normal menstrual cycles were screened for the drumsticks in polymorphonuclear neutrophil leucocytes. The smears were collected at the different intervals of menstrual cycles and in each case at least 1000 cells were screened. Statistical ana-

lysis of the results revealed a significant rise in drumstick percentage on 13th and 17th days of menstrual cycle.

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