LETTER TO THE EDITOR

ELECTRO-CARDIOGRAPHIC AND SERUM ELECTROLYTE CHANGES DURING MENSTRUAL CYCLE

Sir,

(Received on December 9, 1983)

The fact that among other changes menstruation involves bleeding from the blood vessels injured at the site of shedding of the uterine mucosa, has evoked interest in the blood changes in different phases of menstrual cycle. Repeated haemorrhage might affect the circulatory system and variations in estrogen level in blood during menstrual cycle could affect the blood volume of normal woman and thus its cardiac activity and consequent electrocardiographic pattern.

Electrocardiographic changes and serum sodium and potassium levels were studied in 18 female medical students in the age group of 17–23 years. All the subjects were having normal menstrual cycles 28 ± 4 days. The duration of menstrual bleeding being 2–3 days with loss of normal quantity of blood. Record of their basal body temperature showed ovulatory cycles. Blood samples were taken in four phases at weekly intervals. First phase (menstrual) 1-7 days, Second phase (pre-ovulatory) 8–14 days, third phase (post-ovulatory) 15–21 days and fourth phase (pre-menstrual) 22–28 days. Serum sodium and potassium were estimated by means of flame photometer (7). A 12 lead E.C.G. of each subject was recorded with "Siemen's cardiostat super" at weekly intervals more or less at the same time of the day each time. Body weight was also recorded at the time of collection of blood.

Results show an increase in the duration of P wave particularly in L II and V_4 in fourth phase, QRS complex showed no change in duration but an increased amplitude was observed in second phase being maximum in L II and V_5. Duration of T wave was maximum in first phase particularly in V_4 while amplitude was maximum in second phase in lead V_5. QT interval was maximum in second phase in lead L II and V_3 while in fourth phase it was maximum in V_1 however all the above variations were within normal limits. Average heart rate was found to be 79.05, 78.81, 78.6 and 81.6 per min in first, second, third and fourth phase respectively. An increase in serum sodium and potassium in third and fourth phase was observed as compared to first and second (Table I).

TABLE I : Showing serum sodium, potassium and body weight during various phases of menstrual cycle.

Parameters	*I*		*II*		*III*		*IV*
Serum Na in meq/L	131.66±6.9		134.53±7.4		135.0±11.2		138.0±5.0
Mean and sd. 't' value		0.63		1.06		1.15	
Significance.		P>.05		P>0.5 (N.S.)		P>.05 (N.S.)	
Serum K in meq/L Mean and sd.	2.27±0.5		4.49±0.4		4.50±0.6		4.62±0.7
't' value		1.55		0.18		0.05	
Significance.		p>0.05 (N.S.)		p>0.05 (N.S.)		p>0.05 (N.S.)	
Weight in lbs.	101.23		101.58		102.52		103.29

N.S. = Not significant.

The increase in P wave in fourth phase and T wave in first phase had been attributed to hormonal disturbances (4) during the menstrual cycles. The greater amplitude of T wave in second phase is correlated with increased concentration of serum potassium in this phase and is in agreement with the findings of Lanari *et al.* (5) and Benerjea *et al.* (2). The amplitude of QRS complex is also greater in second phase but duration is equal in all phases. This could also be due to change in levels of the circulating hormones. Increase in QT interval in fourth phase may be due to changes in serum electrolytes particularly raised levels of sodium.

Increase in serum sodium during the secretary phase is due to increased level of estrogen around ovulation along with depressed metabolism and consequent lack of energy expenditure which might be responsible for the accumulation of sodium inside the endometrial cells. Histological studies made by Achari, *et al.* (1) lend support to this hypothesis. Increase in serum potassium level in third and fourth phase is in accordance with the findings of Achari *et al.* and Rosado *et al.* (1, 6). Increased permeability of vessel wall is seen in Secretory phase which causes more influx of potassium in the blood vessels. Potassium has got a tendency to leak out of the cell because of its concentration gradiant unless actively held back. Hence in the proliferative phase potassium is retained inside the cells, leading to lower levels of potassium in blood. Fenn (3) and Benerjea (2) observed minimum level of serum potassium at the time of menstruation and there was definite rise at the time of ovulation. This is in conformity with the present

findings. Increased body weight in fourth phase coincides with raised level of serum sodium which may be the cause of increase in weight due to retention of fluid in the body.

S. DATTA, S. GAUR AND R. P. BHARGAVA

Department of Physiology,
Gandhi Medical College, Bhopal - 461 001

REFERENCES

1. Achari, K., S. Sahay and K. Sharan. Biochemical changes in uterine fluid after insertion of various types of intrauterine contraceptive device. *J. Obst. & Gyne. of India.* **28** : 204, 1978.
2. Benerjea, B.K. and S.C. Sen. Electrocardiographic variation manifested during menstruation. *J. Obst. & Gyne. of India.* **28** : 125–127, 1978.
3. Fenn, W.O. *Physiol. Review*, **20** : 377, 1940. Quoted from "Electro-Cardiographic variation manifested during menstruation. **28** : 125–127, 1978.
4. Katz, L.N. Quoted from Electrocardiography IInd Edn. Lea and Febigar, Philadelphia, P. 215, 1947.
5. Lanari, A., L.O. Chait and C. Capurro. *Am. Heart. J.*, **67** : 357, 1964. Quoted from *J. of Obst. & Gynaecol. of India*, **28** : 125–127, 1978.
6. Rosado, A., J. Juan, R. Hicks, J. Azhar and M. Martinez. Effect of intrauterine contraceptive device upon the biochemical composition of human endometrium. *Am. J. Obst. & Gyn.*, **114** : 88, 1972.
7. Varley, Harold. Determination of sodium and potassium by means of the flame photometer. Practical chemical Biochemistry. 4th Ed. New Delhi. Arnold Heinemann Publishers (India) Pvt. 491–495, 1975.