

STUDY OF ELECTROCARDIOGRAPHIC CHANGES IN NORMAL NON-PREGNANT AND PREGNANT WOMEN

by

D. R. TRIVEDI*

C. A. DESAI**

and

S. CHANDWANI***

A number of physiological adjustments take place during pregnancy to supply adequate food and oxygen to foetus. Boyle and Jones (1966) studied ST segment of ECG in pregnancy and found that out of 104 cases only 4 on a single occasion had ST segment depression. Their findings in their study were in marked contrast to those of Oram and Holt (1961). Oram and Holt in their study of 100 normal pregnant women found only 14 showing ST segment depression between 0.5 and 1.00 mm. Walters and Lim (1970) stated that electrical axis is deviated to the left to a maximum of 15° and T wave becomes flattened in lead III. Hollman (1977) reported that during pregnancy heart deviated to the left and rotated in a clockwise direction. The clockwise rotation produces an interesting combination of changes with a prominent 'S' wave in lead I and deep Q wave and often T wave in lead III. Several similar studies were made using only standard limb leads electrocardiogram. Few workers later on reported electrocardiographic changes using pre-

cordial leads (Zatuchni 1951; Padmavati 1957). Present series was planned to study the electrocardiographic changes using all the routine 12 leads LI, LII, LIII, avR, avL, avF, V₁, V₂, V₃, V₄, V₅, V₆.

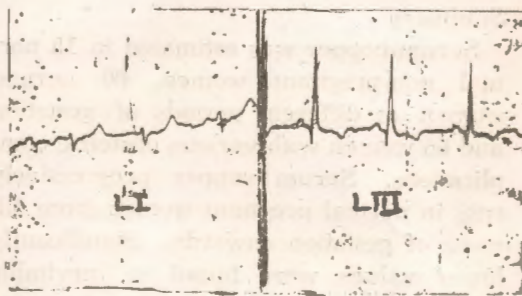


Fig. 1 Electrocardiogram showing deep Q wave and inverted T wave in lead III.

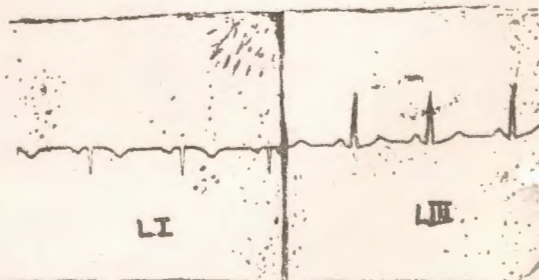


Fig. 2 Electrocardiogram showing left axis deviation.

*Tutor in Physiology.

**Professor and Head, Department of Physiology.

***Associate Professor, Department of Physiology, Medical College, Baroda.

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Material and Methods

The study was conducted in the antenatal clinic of Shree Sayaji General

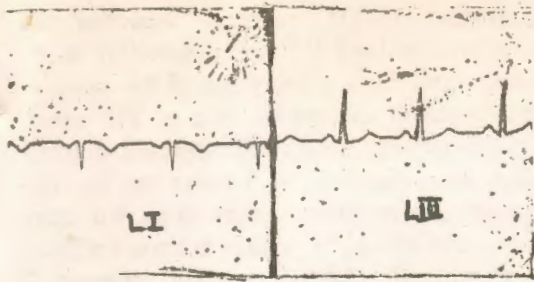


Fig. 3

Electrocardiogram showing right axis deviation.

Hospital and Department of Physiology, Medical College, Baroda. The pregnant women were made to rest on the examination table and detailed history was taken. While selecting subjects due care was taken to minimise variation due to age and parity. All the women were receiving no other medicines except the routine iron and multivitamins therapy. Clinical examinations was carried out to exclude women with organic diseases and anaemia. Twenty-five normal pregnant women

each of first trimester, second trimester and third trimester were selected for study. For control group, female relatives of the subjects were selected who were of the same age group and socio-economic status. All 12 lead electrocardiogram (ECG) was taken.

Observations

(1) *Heart Rate*—The average heart rate of control group subjects was 87.6 ± 4.335 and in first, second and third trimesters it was 93.12 ± 3.699 , 96.0 ± 6.370 and 102.1 ± 9.399 respectively.

(2) *Cardiac rhythm*—The cardiac rhythm was regular throughout the pregnancy in all the subjects with sino-auricular mechanism.

Table I shows that ECG during pregnancy remains within the normal limits. The voltage and duration of P wave, QRS complex, PR interval, R wave remains within normal range with following changes.

TABLE I
Mean and SD (\pm) of Control 1st Trimester, 2nd Trimester and 3rd Trimester

E.C.G. variable	Control	Gestational weeks		
		1st trimester	2nd trimester	3rd trimester
1. P. wave				
Voltage (mv)	0.113 ± 0.032	0.121 ± 0.040	0.131 ± 0.053	0.149 ± 0.052
Duration (sec)	0.08 ± 0.007	0.08 ± 0.006	0.08 ± 0.006	0.08 ± 0.005
2. QRS complex				
Voltage (mv)	0.381 ± 0.270	0.337 ± 0.240	0.728 ± 0.347	0.800 ± 0.313
Duration (sec)	0.06 ± 0.012	0.06 ± 0.013	0.06 ± 0.014	0.059 ± 0.015
3. T. wave				
Voltage (mv)	0.098 ± 0.044	0.076 ± 0.047	0.15 ± 0.174	0.105 ± 0.040
Duration (sec)	0.135 ± 0.014	0.13 ± 0.020	0.126 ± 0.022	0.128 ± 0.021
4. PR. Interval				
Duration (sec)	0.111 ± 0.019	0.110 ± 0.019	0.106 ± 0.017	0.10 ± 0.020
5. ST Segment				
Duration (sec)	0.10 ± 0.021	0.097 ± 0.018	0.08 ± 0.017	0.090 ± 0.024
6. Cardiac rhythm	Sino-auricular	Sino-auricular	Sino-auricular	Sino-auricular

(a) *Q wave in lead III*: Q wave 0.1 to 1.25 mm deep was observed in 12 cases of third trimester. In no case the Q was pathological.

(b) *ST segment*: ST segment was isoelectric in 72 cases. In the remaining 3, ST segment was depressed by less than 0.5 mm in one or more leads.

(c) *T wave*: Inverted T wave in lead III found in 11 cases of third trimester.

(d) *S wave*: Prominent S wave in lead I was observed in 8 cases of third trimester.

(e) *Electrical axis*: There is no axis deviation during first and second trimesters while in third trimester 5 subjects showed left axis deviation and eight subjects showed right axis deviation.

Discussion

The changes in the electrical position of the heart during pregnancy have been reported by various workers. (Zatuchni 1951; Padmavati 1957; Singh *et al* 1967; Walters and Lim 1970; Hollman 1977). Zatuchni (1951) observed a change in the position of the heart with advancing pregnancy in 50% cases. We have also observed left axis deviation in 5 cases and right axis deviation in 8 cases of third trimester.

Feldman and Hill (1934-35), Hollander and Crawford (1943), Hollman (1977), Singh *et al* (1967) have reported deep Q wave in lead III. The Q wave of significance were present in 49% cases in the series reported by Carr and Palmer (1934-35) and in 5.5% cases in the series of Padmavati (1957). In the present study, Q waves were present in 48% of cases of third trimester but in no case was it of pathological significance.

Hollander and Crawford (1934), Boyle and Jones (1966) did not observe any significant changes in ST segment while

Zatuchni (1951) reported elevated ST segment in lead III and precordial leads. Oram and Holt (1961) found 14 cases of ST segment depression out of 100 cases. In the present study, ST segment depression was observed in 3 cases but the depression was never more than 0.5 mm deep and would be within normal limits.

Padmavati (1957) reported inverted T wave in lead III in 85% cases in her study. Singh *et al* (1967) reported very much similar results. We observed inverted T wave in lead III in 44% cases of third trimester.

Jenson and Norgard (1927), Weber (1926) reported cardiac hypertrophy during pregnancy and many ECG changes during pregnancy were attributed to it. None of the cases in our study showed either right or left ventricular hypertrophy.

It seems that most of the ECG changes take place in late pregnancy. Hollman (1977) explained that the ECG changes are due to change in position of the heart. When diaphragm rises during pregnancy, the position of the heart is changed and this is reflected in the alteration in the electrical axis. The position of the heart is altered in two dimension by being deviated to the left and also by being rotated in a clockwise direction. This represents a change in position of left auricle rather than dilatation. The first change produces left axis deviation characterized by the presence of prominent S wave in lead III. The clockwise rotation produces prominent S wave in lead I, Q wave in lead III and inverted T wave in lead III.

Summary

A study of electrocardiographic changes during pregnancy in 25 normal pregnant women each of first, second and third trimester has been reported. The study

was carried out in the antenatal clinic of S.S.G. Hospital and Department of Physiology, Medical College, Baroda. P wave, PR interval, QRS complex were within normal range. ST segment depression was observed in 3 cases but in none of these was it more than 0.5 mm deep.

Prominent S wave in lead I in eight subjects, deep Q wave in lead III in 12 subjects and inverted T wave in lead III found in 11 subjects of third trimester. Left axis deviation in five subjects and right axis deviation in eight subjects were observed in third trimester.

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