

AN ANALYSIS OF NORMAL ELECTROCARDIOGRAMS

Girls Aged 5 to 15 Years

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AN analysis of one hundred normal electrocardiograms from school-boys, ranging in age from 5 to 15 years, has already appeared in print in a previous issue of this journal. In the present issue, we present a study of fifty normal electrocardiograms from girls of school-age (5 to 15 years), the mode of study and selection of material being along similar lines. As a result of this study we are able to set forward normal electrocardiographic standards for Indian subjects of school-age.

The P Wave

The P wave or deflection represents the electrical activity of the auricular heart-muscle; hence the application of the designation "auricular wave" to this deflection.

Form of the P Wave.—It is customary to describe the P wave as "a smooth and rounded elevation"; such a description of the P wave has been handed down from author to author, without any enquiry into the true state of affairs. It was asserted in my previous communication, on the basis of one hundred normal electrocardiograms from boys of school-age, that the "pointed-form" of P wave is more commonly encountered than the "rounded form". In the present series of cases, the pointed form of P was about three times as common as the rounded form (the percentage frequencies being 53% and 17% respectively).

The greater frequency of the "pointed form" of P was obvious in all the standard leads (see Table 1).

Besides "pointed" and "rounded" forms, the P wave displays a variety of other appearances. Transition forms between the pointed and rounded varieties are met with. They were observed in 12% of records in Lead I and in 4% of records in Lead III. Flat or iso-electric P waves were seen in

Lead III in 16% of records. Inverted or negative P waves were noted in Lead III only, in 4% of records. Diphasic or bi-directional P waves were observed in Lead I in 2% of cases and in Lead III in 22%.

Befid P waves were seen in Lead I in 4% of records. In Lead II in 10% and in Lead III in 8%.

In 20% of records, there was no deflection of the P wave above the iso-electric line, in Lead III.

Notching of P waves.—Notching of the P wave is not confined to cases of auricular hypertrophy, as was once believed. It may occur even in normal records. In the present series, notching of P was observed in one or more leads in 22 records (*i.e.*, 44%) ; in no case was notching observed in all the three leads. Notching of P_1 was noted in 7 records (14%), of P_2 in 15 records (30%) and of P_3 in 7 records (14%). In 7 records (14%), there was notching of P in two leads ; notching of P_1 and P_2 in one record, of P_1 and P_3 in 2 records and of P_2 and P_3 in 4 records. In 15 records (30%), notching of P was confined to one lead only ; notching of P_1 in 4 cases, of P_2 in 10 cases and of P_3 only once.

Notching in P waves of large amplitude.—It is the general concensus of opinion that the association of large amplitude and notching in P waves should be considered pathological and suggestive of a diagnosis of mitral stenosis. In the present series, there was only one record with large and notched P waves (case 30 with notched P waves, 2.2 mm. in height). There was no evidence of mitral disease in this case. In the other cases of P wave notching, the amplitude of P ranged from 0.4 to 1.8 mm.

Relation of T to P Waves.—A relationship has been observed between the P and T waves of a given Lead, by various observers.

In the present series, it was noted that inverted P waves are always accompanied by inverted T waves. This rule, however, does not hold the other way about. With diphasic P waves (11 cases), the corresponding T waves were diphasic in 4 and inverted in 7 cases. With flat or iso-electric P waves (8 cases), the T waves were flat in 3, inverted in 4 and upright in one case.

Amplitude or Height of the P wave.—In my series of fifty normal school-girls, the average value of P for all Leads was 0.88 mm. The average value for Lead I was 0.79 mm., for Lead II 1.30 mm. and for Lead III 0.56 mm., the highest values being observed in Lead II.

Range.—In Lead I, the height of the P wave ranged from 0.0 to 1.4 mm., in Lead II, from 0.0 to 2.2 mm., and in Lead III, from -0.6 to 3.1 mm. The value of 3.1 mm. was only observed once in Lead III.

An analysis of the amplitude of P in the three leads is reproduced in Table 2.

Duration of P wave.—In the present series, the mean value of P wave duration for the three Leads was 0·081 sec. The average values for the individual Leads were:—

0·080 sec. for Lead I, 0·092 sec. for Lead II and 0·071 sec. for Lead III.

The duration of P ranged from 0·03 to 0·14 sec. in Lead I, from 0·06 to 0·14 sec. in Lead II and from 0·03 to 0·11 sec. in Lead III. The longest duration of P in my series was 0·14 sec. observed once in Lead I and once in Lead II. For further details, see Table 3.

P-Q Duration

This is measured from the end of P to the beginning of the Q wave.

In my series, the average value of P-Q for all Leads was 0·044 sec. The average values for the individual leads were: Lead I = 0·039 sec.; Lead II = 0·040 sec.; Lead III = 0·052 sec.

Range.—In Lead I, P-Q duration varied from 0·01 to 0·07 sec., in Lead II from 0·00 to 0·09 sec., and in Lead III from 0·01 to 0·09 sec.

Maximum values for P-Q duration were found in Lead I in 22% of cases, in Lead II in 38% and in Lead III in 62%. A P-Q duration constant in the three Leads, was discovered in 4% of cases. Maximum values for P-Q were observed in two Leads in 14% of records; Leads I & II in 4%; Leads II & III in 8% and Leads I & III in 2%.

Further particulars about P-Q duration are incorporated in Table 4.

P-R Interval

This is measured from the beginning of P to the beginning of QRS.

In this series, the value of P-R interval ranged from 0·08 to 0·20 sec., taking all Leads into consideration. The average values for the individual leads were:—

Lead I = 0·118 sec.; Lead II = 0·125 sec.; Lead III = 0·123 sec. The average value for all Leads was 0·122 sec. Tables 5 and 6 give our analysis of the P-R interval.

P-R interval in the Lead of Largest Measurement.—Maximum P-R interval values were observed 17 times in Lead I, 28 times in Lead II and 20 times in Lead III. The P-R interval was found equal in all Leads in three records. Maximum values for P-R were shared by two Leads on 9 occasions;

4 times in Leads I and II, 3 times in Leads II and III and twice in Leads I and III.

Values for the maximum P-R interval ranged from 0·10 to 0·20 sec., in the fifty records, the average value being 0·135 sec.

P-R Level or the Auricular T Wave

A mild degree of deflection (practically always in a downward direction) is a more or less constant feature of the interval between the end of P and beginning of QRS. It is due to auricular contraction and corresponds to the T wave of the ventricular complex.

In my series of 50 records, a downward deflection of the P-R interval was noted in all three Leads in 14 records (28%) and in two Leads in 22 records (44%); deflection of the P-R confined to one lead only was observed in 9 records (18%). In 5 records (10%), there was no deflection of P-R in any Lead.

Deflection of P-R was in a downward direction in all cases. It ranged from 0·0 to 2·1 mm. The average value of the P-R deflection for all Leads was 0·26 mm. In Lead I, P-R deflection ranged from 0·0 to 0·6 mm. with an average of 0·2 mm.; in Lead II, from 0·0 to 1·2 mm. with an average of 0·3 mm.; in Lead III, from 0·0 to 2·1 mm. with an average of 0·28 mm. (For further details see Table 7.)

Q R S Complex or Group

This complex is made up of three peaks or waves, Q, R and S.

Duration of Q R S Complex.—This is measured from the beginning of Q to the end of S. In my series of 50 normal school-girls, the duration of Q R S varied from 0·04 to 0·11 sec. The minimum value of 0·04 was seen in all Leads while the maximum value of 0·11 sec. was only observed once in Lead III.

The average value for Q R S, for all Leads, was 0·067 sec. Average figures for the three Leads, separately were:

Lead I = 0·067 sec. ; Lead II = 0·067 sec. ; Lead III = 0·068 sec.

(For further particulars, see Table 8.)

Duration of Q R S in the Lead of Largest Measurement.—The largest value of Q R S in any given record is usually taken as the correct measurement of Q R S.

The fifty records in my series were investigated from this point of view. Maximum values for Q R S were observed 21 times (42%) in Lead I, 20 times

(40%) in Lead II and 24 times (48%) in Lead III. In 4 records (8%) the same value of Q R S was shared by all Leads. Maximum values for Q R S were shared by two leads on 7 occasions (14%).

Values for maximum Q R S duration ranged from 0·05 sec. to 0·11 sec., in the fifty records with an average value of 0·073 sec.

(See Table 9 for further particulars.)

The Q Deflection or Wave

Incidence.—In my series of 50 cases, a Q wave observed in Lead I in 52% of cases, in Lead II in 60% and in Lead III in 70% of cases. In other words, in a series of 50 cases, Q was absent in Lead I 24 times, in Lead II 20 times and in Lead III 15 times. A Q wave was seen in all leads in 12 records (24%). In 20 records (40%), a Q wave was observed in two Leads, 4 times in Leads I and II, 11 times in Leads II and III and 5 times in Leads I and III. In 12 records (24%), the Q wave was confined to one Lead only, 4 times to Lead I, twice to Lead II and six times to Lead III. In 5 records (10%), there was no Q wave in any of the Leads.

Amplitude or height of Q Wave.—The height of Q varied from 0·0 to 3·4 mm. in the fifty records. The maximum value of 3·4 mm. was observed only once in Lead III. The average value of Q for all Leads was 0·57 mm. In Lead I, Q wave amplitude ranged from 0·0 to 3·0 mm. with an average of 0·48 mm.; in Lead II, from 0·0 to 2·1 mm. with an average of 0·38 mm.; in Lead III, from 0·0 to 3·4 with an average of 0·86 mm.

(For further details see Table 10.)

The R Deflection or Wave

Amplitude.—In my series the height of R ranged from 1·0 to 14·6 mm. in the three Leads. The mean value for all Leads was 6·37 mm. In Lead I the amplitude of R varied from 1·8 to 11·2 mm. with an average of 6·0 mm.; in Lead II, it varied from 3·4 to 14·6 mm. with an average of 8·43 mm. in Lead III, it varied from 1·0 to 12·4 mm. with an average of 4·7 mm. The R wave amplitude values were highest in Lead II in the majority of records. In 40 records (80%), largest amplitudes of R were observed in Lead II, in 10 records (20%) in Lead I and in 1 record (2%) in Lead III. In Table 11, are recorded my analysis of R Wave amplitude.

Out of the 50 records in my series, there were 10 records (20%) with R waves in all Leads less than 7 mm. in height. The maximum deflection of R in these 10 records ranged from 4·1 to 7·0 mm., there was no evidence of heart disease in any of these cases. There were two records with the maximum R deflection under 5 mm. in height (4·1 and 4·6 mm.).

The S Deflection or Wave

Incidence.—An S wave was present in the majority of cases. It was observed in Lead I in 60% of records, in Lead II in 58% and in Lead III in 46%.

Height of the S Wave.—The amplitude of S ranged from 0·0 to 6·8 mm. in the fifty cases, the maximum value being observed once in Lead I. The average value for all cases was 0·79 mm. In Lead I, the height of S ranged from 0·0 to 6·8 mm. with an average of 1·01 mm. In Lead II, it ranged from 0·0 to 3·2 with an average of 0·77 mm. In Lead III, it ranged from 0·0 to 3·5 with an average of 0·58 mm.

In 7 records (14%), there was complete absence of the S Wave. S_1 and S_2 were absent in 5 records (10%) ; S_2 and S_3 were absent in 9 records (18%) ; S_1 and S_3 were absent in 2 records (4%).

An analysis of the S Wave is reproduced in Table 12.

Values over 6 mm. were observed in one record only, in Lead I.

Notching and Slurring of Q R S.—In this series of 50 cases, *notching* of R was not observed in Lead I or II in any of the records. Notching of R in Lead III was observed 8 times (16%). All R_3 waves with notching were of small amplitude (from 1·6 to 3·0 mm.) except in one case, where the amplitude of notched R_3 waves was 8·0 mm.

Definite notching of S was observed in one record only, in Lead III.

Hence, in normal records, notching of Q R S, if present, is usually confined to Lead III with small Q R S complexes.

“*Basal Slurring*” of R, that is thickening of the limb or limbs of R at its junction with the base-line, was observed in 22 of my records (44%). In no case was basal slurring of R observed in all three Leads. In 12 records (24%), it was observed in two Leads, once in Leads I and II, six times in Leads II and III and five times in Leads I and III.

In 10 records (20%), basal slurring of R was confined to one Lead only; twice to Lead I, twice to Lead II and six times to Lead III.

“*Apical Slurring*” of R, where thickening or splaying of the limb of R is not adjacent to the base-line, is a much more serious condition than basal slurring. In my series it was observed in 7 records (14%). In only one record was it observed in two Leads (case II with slurring in Leads I and III). It occurred 4 times in Lead I and 4 times in Lead III ; Apical Slurring of R was not observed in any record in Lead II.

R waves with apical slurring were of small amplitude (from 2.2 to 5.0 mm.) except in two cases, with amplitudes over 5 mm. (6.7 mm. and 6.8 mm. in cases 11 and 41 respectively).

In two records, there was combined notching and slurring of R waves.

Basal slurring of R was observed 11 times in the "upstroke" of R and 23 times in the "downstroke". Apical slurring of R was observed twice in the upstroke and 6 times in the downstroke.

The S-T Interval.—This is measured from the end of S to the beginning of T. Measurement of the S-T interval may be impossible in cases where T takes origin directly from the S wave. In the present series, the duration of the S-T interval in the three Leads varied from 0.01 to 0.16 sec. The minimum value of 0.01 sec., was only observed once, in Lead II; the maximum value of 0.16 sec. was noted twice, once in Lead II and once in Lead III. The average value of S-T interval for the three Leads was 0.090 sec.

In Lead I, the S-T interval varied from 0.03 to 0.13 sec. with an average of 0.086 sec.; in Lead II, it varied from 0.01 to 0.16, with an average of 0.088 sec.; in Lead III, it varied from 0.03 to 0.16, with an average of 0.096 sec. An analysis of the S-T interval is reproduced in Table 13.

The S-T interval could not be measured in Lead I in 3 records, in Lead II in one record and in Lead III in 10 records.

In one record, duration of the S-T interval was identical in the three leads, the value being 0.09 sec. In 14 records (28%) maximum values for S-T were observed in Lead I. Of these 14 records, 6 showed values in lead II.

In 22 records (44%), maximum values for S-T were noted in Lead II. Of these, 6 showed similar values in Lead I and 6 in Lead III.

In 26 records (52%), maximum values for S-T were observed in Lead III. Of these, 6 showed similar values in Lead II.

From these figures, it will be noted that maximum values for S-T occur most frequently in Lead III.

Relation of the S-T segment to the base-line.—Deviation of the S-T segment from the P-R level was measured in the fifty records of my series. In Lead I, the S-T segment was at the level of the P-R segment in 23 records (46%), raised in 6 (12%) and depressed in 21 (42%) records. Depression of the S-T segment was much commoner than elevation (ratio of 3 : 5 to 1.0) in Lead I. In Lead II, the S-T segment was iso-electric in 19 (38%) raised in

7 (14%) and depressed in 24 (48%) records ; depression of S-T was 3.5 times as common as elevation. These findings are quite opposed to those of Hoskin and Jonescu, who find elevation of S-T to be much more common than depression, in Leads I and II.

In Lead III, the S-T segment was iso-electric in 23 (46%) raised in 17 (34%) and depressed in 10 (20%) cases. Elevation of S-T was more common than depression of S-T, in Lead III.

Deflection of S-T from the level of P-R seldom exceeds 1 mm. In my series, upward deviation of S-T ranged from 0.2 to 0.7 mm. Depression of S-T ranged from 0.2 to 1.4 in the fifty cases, the maximum value being attained only once in Lead I. Values over 1 mm. were encountered in only 2 records, the deviations being 1.4 mm. and 1.1 mm. respectively.

In one record the S-T segment was found depressed in all Leads. Elevation of S-T in all Leads was not found in a single record. In 6 records (12%) there was elevation of S-T in one Lead, depression of S-T in one Lead and isoelectric S-T in the remaining Lead. In 5 records (10%) S-T was raised in two Leads and depressed in one.

In 6 records (12%), S-T was depressed in two Leads and raised in one. 2 Records (4%) showed raised S-T in two Leads and iso-electric S-T in the remaining Lead. 10 Records (20%) showed depressed S-T in two Leads and iso-electric S-T in the remaining Lead. In 14 records (28%), deviation of S-T was confined to one Lead only; of these, 4 showed elevation and 10 showed depression of the S-T segment. In 6 records (12%), the S-T segment was iso-electric in all Leads.

S-T Duration

This is measured from the end of S to the end of T. In these series of fifty normal school-girls, the S-T duration ranged from 0.18 to 0.38 sec. in the three Leads. The minimum value of 0.18 sec., was found once in Lead III, the Maximum value of 0.38 sec. was noted once in Lead III. The average value of S-T duration for all Leads was 0.245 sec.

In Lead I, S-T duration ranged from 0.19 to 0.32 sec. with an average of 0.25 sec.: in Lead II, it ranged from 0.19 to 0.32 sec., with an average of 0.25 sec., in Lead III the range was 0.18 to 0.38 sec., and the average was 0.24 sec.

An analysis of the S-T duration is reproduced in Table 14.

The T Wave or Deflection.—The T wave forms the last of the ventricular deflections.

Direction of the Wave.—In the present series, the T Wave in Lead I was upright in all cases. In Lead II, the T was upright in all but three cases ; in case 18, it was diphasic, in case 20, it was flat and in case 24, it was inverted. In Lead III, T was upright or positive in 2 (4%), inverted or negative in 42 (84%), diphasic or bidirectional in 2 (4%) and flat or iso-electric in 4 (8%). In Lead III, therefore, the T wave was inverted in the great majority of cases.

Form of the Wave.—T waves can be classified into two broad groups according to the contour, *viz.*, the “pointed form” of T and the “rounded form” of T. In my series of fifty cases, the “pointed” or “peaked form” of T was encountered slightly more often than the “rounded form” (ratio of 12:11).

In Lead I, the T wave was “pointed” in 36 records, “rounded” in 11 records and of the “mixed variety” (rounded and pointed) in 3 records. In Lead II, T was “Pointed” in 16, “rounded” in 30 and “mixed” in 3 records; in one record, T was iso-electric. In Lead III, T was “pointed” in 20, “rounded” in 24 and “mixed” in 1 record ; in 4 records, it was iso-electric and in 2, diphasic.

The proportion of “pointed” to “rounded” forms of T in the three Leads were as follows:

Lead I, 3·5: 1·0; Lead II, 1 : 2; Lead III, 5 : 6.

In 4 records, T was “pointed” or “peaked” in all Leads; in 5 records, it was “rounded” in all Leads.

Amplitude of T waves.—The amplitude or height of T ranged from $-4\cdot1$ to $5\cdot8$ mm., in the three Leads. The mean value of T for all Leads was $1\cdot17$ mm.

In Lead I, the size of T ranged from $1\cdot0$ to $5\cdot0$ mm. with an average of $2\cdot76$ mm.; in Lead II, it ranged from $1\cdot0$ to $5\cdot8$ mm. with an average of $1\cdot90$ mm.; in Lead III, it ranged from $-4\cdot1$ to $+1\cdot1$ mm. with an average of $-1\cdot15$ mm.

An analysis of T wave amplitude is reproduced in Table 15.

Size of T in the Lead of Largest Measurement.—In my series, the value of T in the Lead of largest measurement ranged from $1\cdot4$ to $5\cdot8$ mm. values of 2 mm. and under were observed eleven times (22%); values of $5\cdot0$ mm. and over were observed only twice (4%). Maximum amplitudes of T were observed in Lead I 41 times (82%), in Lead II 9 times (18%) and in Lead III only twice (4%).

(For further particulars see Table 16.)

Duration of T Wave.—In my series, the duration of T ranged from 0·08 to 0·26 sec., with an average value of 0·18 sec., for all Leads. In Lead I, duration of T ranged from 0·12 to 0·24 sec., with an average of 0·18 sec. In Lead II, it ranged from 0·14 to 0·26 sec., with an average of 0·19 sec. In Lead III, it ranged from 0·08 to 0·26 mm. with an average of 0·17 sec. The minimum value of 0·08 sec., for all Leads was attained only once in Lead III while the maximum value of 0·26 was attained twice, once in Lead II and once in Lead III.

An analysis of T wave duration is reproduced in Table 17.

Q-T Duration or Duration of the Ventricular Complex

This is measured from the beginning of Q R S to the end of T, in the Lead of largest measurement.

In my series of fifty normals, maximum values for Q-T were observed in Lead I on 21 occasions, in Lead II on 24 occasions and in Lead III on 13 occasions.

Maximum values of Q-T were shared by two Leads 9 times; 5 times in Leads I and II, once in Leads II and III and 3 times in Leads I and III.

The duration of Q-T ranged from 0·29 to 0·42 sec., in the fifty records, with an average of 0·344 sec. (see Table 18).

The Q-T Duration in Relation to the Heart-rate

A definite relationship is usually observed between the duration of Q-T and the rate of the heart, a gradual diminution of Q-T being observed with increasing rates of the heart (see Table 19).

The U Wave

The U wave or “the sixth wave of the electrocardiogram” was investigated in the fifty records of the present series. U waves were observed in one or more Leads in 20 records (40%). In no record were U waves observed in all the three Leads. They were noted in two Leads in 6 records (12%), five times in Leads I and II and once in Leads II and III. In 14 records (28%), U waves were confined to one Lead only, 4 times to Lead I, 7 times to Lead II and III times to Lead III.

Form of U Wave—

Two main forms of U wave were encountered (1) the “pointed form” and (2) the “rounded form”. In 14 records (28%), U waves were of the “rounded” variety only; in 2 records (4%) U waves of both forms were

observed. In my series, the "rounded form" of U wave was 3·5 times as common as the "pointed form."

Incidence of U waves in Different Leads—

U waves were most frequently noted in Lead II. They were observed in Lead I in 9 records, in Lead II in 13 records and in Lead III in 4 records. The "pointed form" of U was observed in Lead I on two occasions only, in Lead II 4 times and in Lead III not once (see Table 20).

The amplitude of U ranged from 0·2 to 1·0 mm. in the fifty cases, with an average value of 0·36 mm. The average amplitude of the "pointed form" of U was about 1·7 times that of the "rounded form" (Table 21).

The *duration* of U ranged from 0·06 to 0·20 sec. with an average duration of 0·14 sec. The average duration of the "rounded form" was about 1·5 times that of the "pointed form" of U (Table 22).

Summary

(1) A study is presented of fifty normal electrocardiograms of school-girls, ranging in age from 5 to 15.

(2) Various deflections and "intervals" of the electrocardiogram are measured, analysed and tabulated, whenever possible.

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TABLE 1

Frequency of the Different Forms of P Wave in 50 Cases (Case Numbers)

Description of P Wave	Lead I	Lead II	Lead III
1. Pointed form	26	38	16
2. Rounded form	13	5	7
3. Pointed and rounded	6	0	2
4. Flat or iso-electric	2	2	8
5. Bifid form	2	5	4
6. Inverted form	0	0	2
7. Diphasic form	1	0	11

TABLE 2

Amplitude of the P Wave (Percentage Frequencies)*

Amplitude Range (in mm.)	Lead I	Lead II	Lead III
-1 to 0	0	0	4
0 to 1	84	24	44
1 to 2	14	62	16
2 to 3	0	10	2
3 to 4	0	0	2

* The amplitude of P could not be determined in 2% of cases in Lead I, in 4% in Lead II and in 32% in Lead III.

TABLE 3

Duration of the P Wave in 50 Cases (Percentage Frequencies)*

Duration of P Wave (in seconds)	Lead I	Lead II	Lead III
0.03	2	0	2
0.04	0	0	10
0.05	10	0	8
0.06	20	6	12
0.07	12	8	10
0.08	18	28	20
0.09	14	20	10
0.10	8	10	10
0.11	4	12	2
0.12	2	8	0
0.13	6	4	0
0.14	2	2	0

* The duration of the P Wave could not be determined in one case in Lead I, in one case in Lead II and in 8 cases in Lead III.

TABLE 4
Duration of P-Q in 50 Cases (Percentage)*

Duration of P-Q (in seconds)	Lead I	Lead II	Lead III
0.00	0	2	0
0.01	8	4	4
0.02	12	12	4
0.03	16	22	6
0.04	32	24	15
0.05	14	16	10
0.06	12	8	18
0.07	4	6	20
0.08	0	2	4
0.09	0	2	2

* P-Q duration could not be determined in Lead I once, in Lead II once and in Lead III 8 times.

TABLE 5
Duration of P-R Interval in 50 Cases (Percentages)*

Time Range (in seconds)	Lead I	Lead II	Lead III
0.08 to 0.10	26	16	12
0.10 to 0.12	44	34	36
0.12 to 0.14	22	32	24
0.14 to 0.16	2	12	10
0.16 to 0.18	4	0	2
0.18 to 0.20	0	4	0

* The P-R Interval could not be determined in Lead I once, in Lead II once and in Lead III 8 times.

TABLE 6
Duration of P-R Interval in 50 Cases (Percentages)*

P-R Duration (in seconds)	Lead I	Lead II	Lead III
0.08	4	4	2
0.09	4	0	0
0.10	18	12	10
0.11	18	6	10
0.12	26	28	26
0.13	14	20	8
0.14	8	12	16
0.15	0	8	6
0.16	2	4	4
0.17	0	0	2
0.18	4	0	0
0.19	0	0	0
0.20	0	4	0

* The P-R Interval could not be determined in Lead I once, in Lead II once and in Lead III 8 times.

TABLE 7
Deflection of P-R Level in 50 Cases (Percentages)*

Range of Deflection (in mm.)	Lead I	Lead II	Lead III
0.0 to 0.3	64	34	66
0.4 to 0.7	36	38	26
0.8 to 1.1	0	26	4
1.2 to 1.5	0	2	2
1.6 to 1.9	0	0	0
2.0 to 2.3	0	0	2

* Deflection of P-R, when observed, was in a downward direction in all cases.

TABLE 8
Duration of QRS Complex in 50 Cases (Percentages)

Duration of QRS (in seconds)	Lead I	Lead II	Lead III
0.04	4	8	8
0.05	16	12	10
0.06	24	22	30
0.07	24	24	12
0.08	24	24	28
0.09	8	8	10
0.10	0	2	0
0.11	0	0	2

TABLE 9
Duration of QRS in the Lead of Largest Measurement (50 Records)

Range of QRS Duration (in seconds)	Lead I	Lead II	Lead III	For all Leads
0.04 to 0.06	5	3	5	8
0.07 to 0.08	13	12	17	30
0.09 to 0.10	3	5	2	11
0.11 to 0.12	0	0	1	1

TABLE 10
Q Wave Amplitude in 50 Cases (Percentages)

Q Wave Amplitude (Range) (in mm.)	Lead I	Lead II	Lead III
0.0 to 0.3	6	16	4
0.4 to 0.7	22	26	16
0.8 to 1.1	12	12	22
1.2 to 1.5	4	0	8
1.6 to 1.9	2	4	8
2.0 to 2.3	2	2	4
2.4 to 2.7	2	0	4
2.8 to 3.1	2	0	2
3.2 to 3.5	0	0	2
Absence of Q Wave	48	40	30

TABLE 11

Size of R Wave in 50 Cases (Percentages)

Size of R Wave (Range) (in mm.)	Lead I	Lead II	Lead III
0.0 to 2.9	6	0	30
3.0 to 5.9	50	14	40
6.0 to 8.9	28	46	26
9.0 to 11.9	16	30	2
12.0 to 15.0	0	10	2

TABLE 12

Size of S Wave in 50 Records (Percentages)

Size of S Wave (Range) (in mm.)	Lead I	Lead II	Lead III
0.0 to 1.0	66	72	78
1.1 to 2.0	16	20	14
2.1 to 3.0	12	6	6
3.1 to 4.0	4	2	2
4.1 to 5.0	0	0	0
5.1 to 6.0	0	0	0
6.1 to 7.0	2	0	0

TABLE 13

Duration of S-T Interval in 50 Cases (Percentages)*

Duration of S-T Interval (Range) (in seconds)	Lead I	Lead II	Lead III
0.00 to 0.02	2	2	0
0.02 to 0.04	12	4	4
0.04 to 0.06	4	18	4
0.06 to 0.08	24	22	20
0.08 to 0.10	28	26	26
0.10 to 0.12	22	18	14
0.12 to 0.14	2	6	10
0.14 to 0.16	0	2	2

* The S-T Interval could not be measured in Lead I in 3 records, in Lead II in one record and in Lead III in ten records.

TABLE 14

The S-T Duration in 50 Records (Percentages)*

S-T Duration (Range) (in seconds)	Lead I	Lead II	Lead III
0.16 to 0.18	0	0	2
0.19 to 0.21	12	6	16
0.22 to 0.24	28	28	32
0.25 to 0.27	40	32	20
0.28 to 0.30	16	22	10
0.31 to 0.33	2	4	0
0.34 to 0.36	0	0	0
0.37 to 0.39	0	0	2

* The S-T Duration could not be measured in one record in Lead I, in 4 records in Lead II and in 9 records in Lead III, owing to the iso-electric character of the T Waves.

TABLE 15

Size of T Wave in 50 Cases (Percentages)*

Size of T Wave (Range) (in mm.)	Lead I	Lead II	Lead III
-6.0 to -4.0	0	0	2
-4.0 to -2.0	0	0	8
-2.0 to 0.0	0	2	74
0.0 to 2.0	24	62	4
2.0 to 4.0	66	32	0
4.0 to 6.0	8	2	0
6.0 to 8.0	0	0	0

* The size of T could not be determined in Lead I once, in Lead II once, and in Lead III 6 times.

TABLE 16

Size of T in the Lead of Largest Measurement (Case Numbers)

Size of T (Range) (in mm.)	Lead I	Lead II	Lead III	For all Leads
0.0 to 2.0	8	3	0	11
2.0 to 4.0	30	5	1	35
4.0 to 6.0	3	1	1	4

TABLE 17
Duration of T Wave in 50 Records* (Percentages)

Duration of T (Range) (in seconds)	Lead I	Lead II	Lead III
0.08 to 0.10	0	0	2
0.10 to 0.12	6	0	2
0.12 to 0.14	0	8	18
0.14 to 0.16	14	22	22
0.16 to 0.18	28	20	22
0.18 to 0.20	34	20	16
0.20 to 0.22	10	12	4
0.22 to 0.24	4	10	4
0.24 to 0.26	0	2	2

* The duration of T could not be determined in two records in Lead I, in three records in Lead II and in four records in Lead III.

TABLE 18
The Q-T Duration (Maximum) in 50 Records

Lead	Number of records	Average value (in seconds)	Lowest value (in seconds)	Highest value (in seconds)
Lead I	21	0.341	0.300	0.360
Lead II	24	0.343	0.290	0.410
Lead III	13	0.374	0.290	0.420
For all Leads	50	0.344	0.290	0.420

TABLE 19
Q-T Duration in Relation to the Heart-Rate

Rate of Heart (per minute)	Number of cases	Average value (in seconds)	Minimum value (in seconds)	Maximum value (in seconds)
71 to 80	3	0.387	0.360	0.420
81 to 90	11	0.364	0.340	0.410
91 to 100	12	0.354	0.310	0.410
101 to 110	5	0.360	0.320	0.360
111 to 120	11	0.327	0.310	0.380
121 to 130	6	0.320	0.290	0.360
131 to 140	2	0.310	0.300	0.320

TABLE 20
Incidence of U Waves in the Three Standard Leads

Lead	Number of records with U Waves	Number of records with "rounded" U Waves	Number of records with "pointed" U Waves
Lead I	9	7	2
Lead II	13	9	4
Lead III	4	4	0

TABLE 21

Amplitude of the U Wave in 50 Records

	Average value (in mm.)	Minimum value (in mm.)	Maximum value (in mm.)
1. U Waves in general ..	0.36	0.20	1.00
2. "Pointed form" of U ..	0.52	0.40	1.00
3. "Rounded form" of U ..	0.32	0.20	0.60

TABLE 22

Duration of the U Wave in 50 Records

	Average value (in seconds)	Minimum value (in seconds)	Maximum value (in seconds)
1. U Waves in general ..	0.14	0.06	0.20
2. "Pointed form" of U ..	0.11	0.06	0.18
3. "Rounded form" of U ..	0.15	0.08	0.20

TABLE 23

A Summary of the Main Deflectors of the Electrocardiogram

Deflection	Feature investigated	Average value	Maximum value	Minimum value	Measurements in Lead of largest measurement
P Wave ..	Amplitude	0.88 mm.	3.1 mm.	0.0 in Leads I and II. -0.6 mm. in Lead III	
	Duration	0.081 sec.	0.14 sec.	0.03 sec.	
Q R S complex ..	Duration	0.067 sec.	0.11 sec.	0.04 sec.	Range: 0.05 to 0.11 sec. Average: 0.073 sec.
Q Wave ..	Amplitude	0.57 mm.	3.4 mm.	0.0 mm.	
R Wave ..	Amplitude	6.37 mm.	14.6 mm.	1.0 mm.	
S Wave ..	Amplitude	0.79 mm.	6.8 mm.	0.0 mm.	
T Wave ..	Amplitude	1.17 mm.	5.8 mm.	-4.1 mm.	Range: 1.4 to 5.8 mm.
	Duration	0.18 sec.	0.26 sec.	0.08 sec.	
U Wave ..	Amplitude	0.36 mm.	1.0 mm.	0.2 mm.	
	Duration	0.14 sec.	0.20 sec.	0.06 sec.	

TABLE 24

A Summary of the Main "Intervals" of the Electrocardiogram

Interval	Feature investigated	Average value	Maximum value	Minimum value	Measurements in Lead of largest measurement
P-Q Duration ..	Duration	0·044 sec.	0·09 sec.	0·00 sec.	
P-R Interval ..	Duration	0·122 sec.	0·20 sec.	0·08 sec.	Range: 0·10 to 0·20 sec. Average: 0·135 sec.
P-R Level ..	Deflection	0·26 mm.	2·1 mm.	0·00 mm.	
S-T Interval ..	Duration	0·090 sec.	0·16 sec.	0·01 sec.	
S-T Level ..	Deflection	..	0·7 mm. (upward) 1·4 mm. (downward)	0·2 mm. (upward) 0·2 mm. (downward)	
S-T Duration ..	Duration	0·245 sec.	0·38 sec.	0·18 sec.	
Q-T Duration ..	Duration	0·344 sec.	0·42 sec.	0·29 sec.	