laire s'accompagne souvent d'épigastralsie et parfois d'irradiations à l'hypocondre gauche. La douleur est constante et ne ressemble pas à celle de la colique. La mortalité est de 11 pour cent. Environ 40 pour cent peuvent être traités médicalement pendant 48 heures, puis être opérées sans danger; 50 pour cent ne répondent pas si bien à la préparation pré-opératoire et doivent être opérées après 3 ou 4 jours malgré le risque opératoire; un dernier groupe, difficilement améliorable médicalement doit être opéré d'urgence.

Le champ opératoire doit être parfaitement éclairé. L'incision varie avec les habitudes du chirurgien. Les grosses vésicules doivent être vidées. La pose des pinces et les dissections doivent être soignées et faites judicieusement. On songera aux anomalies. La technique de la cholécystostomie est décrite. Les malades opérés sont suivis attentivement à l'hôpital et longtemps après leur sortie. JEAN SAUCIER

THE ELECTROCARDIOGRAPHIC RECORDS OF 2,000 R.C.A.F. AIRCREW

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CARDIAC accidents occur most frequently in individuals of the middle and older age groups but a number have been recorded in relatively young men. In many instances no previous indications of the condition have been manifest. Such accidents may occur at any place or at any time, and have occurred to individuals while driving motor cars, transports, buses, etc., with serious consequences.

In commercial or civilian aviation the possibility of an aircrew member, including the pilot, suffering a cardiac accident constitutes an added hazard to flying. It is therefore important that individuals with potential cardiac conditions should not have responsible positions as members of aircrew.

In service flying where high speeds, high rate of acceleration, ascents to high altitudes, and rapid descents, are tactically necessary, it is of even greater importance that aircrew personnel be free from any cardiac condition which might predispose to syncope, angina pectoris, or coronary occlusion. Such an accident may not only render the individual incapable of performing his duty but also endanger the lives of the other members of the crew, and jeopardize the safety of the aircraft as well.

Such considerations were the basis for supplementing the standard medical examination for "Fitness for Flying" with additional procedures including routine electrocardiograms. It was felt also, as a secondary consideration, that the analysis of a large number of electrocardiograms taken on young healthy males would supply much-needed basic information which would advance our knowledge of electrocardiography in relation to general medicine.

The purpose of this paper is to present the data obtained from the gross analysis of the electrocardiograms of the first 2,000 men enlisted for aircrew duties under the British Commonwealth Air Training Plan.

Most of the standard textbooks on electrocardiology[1-6] were consulted regarding the accepted normal variations of the various components of the electrocardiographic tracing. The definitions and measurements of these components are summarized as follows:

The P wave is measured along the base from the beginning of the upstroke to the end of the downstroke. It is stated to be upright in all leads, usually smooth, rounded, and showing a summit, but may be notched. The amplitude is less than 2 mm. and the duration is about 0.10 seconds.

The P-R interval is measured from the beginning of the P wave to the beginning of the main ventricular complex, whether it be upright or downwards. In other words the P-R interval may actually, in any given record, be the P-Q interval. The duration is stated to be 0.12 to 0.20 seconds.

The Q wave is the first downward deflection of the main ventricular complex if immediately followed by an upward deflection (R). The amplitude is usually between 1 and 2 mm., but the wave may be absent. Some difference of opinion exists as to the differentiation between the Q wave and the so-called negative R wave.

The R wave is stated to be present in all leads. It is the first upward deflection of the main ventricular complex and may be sharp or notched. The amplitude in Lead I is stated to vary from 1.5 to 12 mm., in Lead II, from 4 to 35 mm., and in Lead III, from 2 to 15 mm.

The S wave is the last downward deflection of the main ventricular complex immediately preceding the S-T segment. The amplitude is stated to be 1 to 6 mm., but the wave may be absent.

The QRS interval is measured from the break in the isoelectric line at the end of the P-R (Q) interval to the return to the isoelectric line after the QRS complex. The interval occupies from 0.08 to 0.10 seconds.

No information is available on normal records showing high or low R-T or S-T take-off in excess of 1 mm. Definite changes have been described following coronary occlusion and infarction.

The R-T or S-T segment is the interval between the end of the QRS complex (the return to the isoelectric) and the beginning of the T wave. It is said to vary from 0.5 to 1.5 mm. above or below the isoelectric line.

The T wave is said to be present always but may be inverted or diphasic in Lead III. Considerable difference of opinion is reported as to the range of amplitude of this wave.

The U wave may be present or absent. If present, it is usually seen in Leads I and II. The amplitude is stated to be about 1 mm.

METHODS AND TECHNIQUE

This study was commenced on April 29, 1940. The subjects were healthy male adults between the ages of 18 and 32, the majority being between 18 and 26 years of age. All had successfully passed the routine medical examination for "Fitness for Flying". Before each record was taken the subject remained at rest for 5 minutes in the recumbent position. A portable Cambridge (English) electrocardiograph was used, recording the 3 standard leads on a single film, each lead of 5 seconds' duration. The deflection of the galvanometer string was standardized before each lead was taken.

For purposes of R.C.A.F. medical records the following arbitrary classification into five groups was agreed upon and the electrocardiograms were categorized accordingly as follows:

Category I. — Textbook normal: P upright and present in all leads, P-R interval between 0.12 and 0.20 seconds, Q present, R present and upright (at least 5 mm.) in all leads, QRS interval between 0.08 and 0.10 seconds, S-T segment isoelectric, T present and upright in all leads.

Category II.—Normal type more frequently seen: P upright and present in all leads, R present and at least 5 mm. in any one lead, no notching or slurring, T present and upright in all leads, all time relationships within normal limits. Q or S may be absent in one or more leads. S-T segment isoelectric.

Category III. — Normal variations. P negative or absent, Q, R or S splintered or notched, R less than 5 mm. in one or two leads, T negative or diphasic in Lead III, S-T elevated or depressed, auricular or ventricular extra systoles.

Category IV.—Doubtful abnormal: Low voltage of R wave in all leads, left or right axis deviation, abnormal time relationships of wave complexes; *i.e.*, prolonged P-R, prolonged QRS.

Category V.—Definitely abnormal: T wave negative in Lead I, Lead II, or in both, pathological arrhythmias, bundle-branch block.

The above classification was necessarily arbitrary and subject to change as a result of the accumulation of data. It was necessary, however, because of the scarcity of information concerning normal records for such an age-group as we were investigating. The electrocardiograms of the first 2,000 aircrew were categorized as follows:

TABLE I.

Category	*Records*	*Percentage*
1.	27	1.35
2.	358	17.9
3.	1,307	65.3
4.	299	14.9
5.	9	0.45

From this analysis it is apparent that the typical "textbook" electrocardiogram is rare. The majority of the records showed variations which necessitated categorization in Group III.

ANALYSIS OF DATA

The following is an analysis of the 2,000 electrocardiograms categorized above. The amplitude of wave complexes was measured to the nearest 0.5 mm. from the top of the base line in positive waves and from the bottom in negative waves, and the time intervals to the nearest 0.02 seconds.

P wave.—In Lead I the P waves were positive in 1,973 records (98.6 per cent), diphasic in 5 (0.25 per cent), negative in 2 (0.1 per cent) and absent in 20 (1 per cent). The P wave was notched in only 13 (0.65 per cent) records which were included in the above figures. In Lead II the P waves were positive in 1,962 records (98.1 per cent), diphasic in 10 (0.5 per cent), negative in 13 (0.65 per cent) and absent in 15 (0.75 per cent) records. The P wave was notched in 34 records (1.7 per cent). In Lead III the P waves were positive in 1,581 records (79.0 per cent), negative in 225 (11.25 per cent), diphasic in 148 (7.4 per cent) and absent in 46 (2.3 per cent). Forty-four (2.2 per cent) of the records showed notched P waves. The number of records with negative or notched P waves was considerably greater than in the other 2 leads (Table II).

P-R interval.—Since the standard of the P-R (PQ) interval is stated to be 0.12 to 0.20 seconds, in this analysis the intervals were grouped as

follows: (*a*) under 0.12 seconds, (*b*) between 0.12 and 0.20 seconds, and (*c*) over 0.20 seconds. In Lead I there were 20 records (1 per cent) in which the P-R interval was less than 0.12 seconds and 14 (0.7 per cent) in which the interval was greater than 0.20 seconds. The remaining 1,946 (or 97.3 per cent) of the records showed a P-R interval in Lead I within the accepted normal limits of 0.12 to 0.20 seconds. In Lead II about the same number 1,949 (97.4 per cent) had P-R intervals within the accepted limits: 5 (0.25 per cent) were less than 0.12 seconds and 31 (1.6 per cent) were greater than 0.20 seconds. In Lead III 1,911 records (95.6 per cent) showed a P-R interval between 0.12 and 0.20 seconds, only 5 (0.25 per cent), less than 0.12 seconds, and 38 (1.9 per cent) in excess of 0.20 seconds (Table III).

Lead II S was present in a smaller number of instances, 1,471 records (73.5 per cent), 415 (20.7 per cent) having an amplitude in excess of 3 mm. The number of records showing S present in Lead III was smaller than in Leads I or II, 1,046 records (52.3 per cent). Only 192 records (9.6 per cent) showed an amplitude of the S wave in excess of 3 mm. (Table IV).

QRS complex.—In Lead I the QRS complex was splintered in 11 records (0.55 per cent), in Lead II 13 records (0.65 per cent), and in Lead III 266 records (13.37 per cent) (Table IV).

QRS interval.—The QRS intervals were recorded as the widest space measured from the break in the isoelectric line at the beginning of Q (or R) to the return to the isoelectric after the S wave (or R). Only one record of the 2,000 analyzed had a QRS greater than 0.10 seconds in all 3 leads. One additional record had a QRS in Lead I in excess of 0.10 seconds, but the interval in Leads II and III was less than 0.10 seconds (Table IV).

TABLE II.

	P Wave					*P-R Interval*		
Lead	*Positive*	*Negative*	*Diphasic*	*Notched*	*Absent*	*Under 0.12 sec.*	*0.12 to 0.20 sec.*	*Over 0.20 sec.*
	per-centage	*per-centage*	*per-centage*	*per-centage*	*per-centage*	*per-centage*	*per-centage*	*per-centage*
I	98.6	0.1	0.25	0.65	1.0	1.0	97.3	0.7
II	98.1	0.65	0.5	1.7	0.75	0.25	97.4	1.6
III	79.0	11.25	7.4	2.2	2.3	0.25	95.6	1.9

TABLE III.

Q wave.—The definition of the Q wave as "the first downward deflection of the main ventricular complex if immediately followed by an upward deflection (R)" was accepted. It was measured to the nearest 0.5 mm. In Lead I the Q wave was present in only 530 records (26.5 per cent). The amplitude was greater than 2 mm. in 13 records (0.65 per cent). In Lead II, however, the Q wave was present in 977 records (48.8 per cent). In 69 (3.4 per cent) of these the amplitude was greater than 2 mm. In Lead III, Q was present in 1,131 records (56.5 per cent) of which 148 (7.4 per cent) had an amplitude greater than 2 mm. (Table IV).

R wave.—The specific amplitudes of the R waves in the respective leads have not yet been measured. Amplitudes of less than 5 mm. were recorded as follows: In Lead I, 764 records (38.2 per cent), in Lead II 36 records (1.8 per cent), in Lead III 532 records (26.6 per cent). These figures include a small number of records in which the R wave was absent (Table IV).

S wave.—In Lead I S waves were present in 1,625 records (81.2 per cent) and 444 (22.2 per cent) had an amplitude of more than 3 mm. In

T wave.—In Lead I the T wave was present in all 2,000 records. In 2 records (0.1 per cent)

TABLE IV.

	Q Wave			*R Wave*	
Lead	*Present*	*Absent*	*Over 2 mm.*	*Over 5 mm.*	*Under 5 mm.*
	per-centage	*per-centage*	*per-centage*	*per-centage*	*per-centage*
I	26.5	73.5	0.65	61.8	38.2
II	48.8	51.1	3.4	98.2	1.8
III	56.5	43.4	7.4	73.4	26.6

	S Wave			*Q R S*	
Lead	*Present*	*Absent*	*Over 3 mm.*	*Notched*	*Greater than 0.1 secs.*
	per-centage	*per-centage*	*per-centage*	*per-centage*	*per-centage*
I	81.2	18.7	22.2	0.55	0.10
II	73.5	26.5	20.7	0.65	0.05
III	52.3	47.7	9.6	13.3	0.05

T I was negative. One of these had positive T II and T III, the other negative T II and T III. In one other record T I was diphasic and T II and T III negative. In Lead II six records (0.3 per cent) showed negative T waves, 4 (0.2 per cent) diphasic T waves and in one record the T wave was absent. In all these records T III was also negative. In Lead III the T waves were negative in a relatively large number of records, 272 (13.6 per cent), diphasic in 266 (or 13.3 per cent) and absent in 37 records (1.85 per cent). Thus, T I was positive in 1,997 records (99.8 per cent), T II positive in 1,989 records (99.4 per cent) but T III positive in only 1,425 records (71.25 per cent). In this preliminary analysis the average amplitude of the T wave was not determined but the total number of records having waves greater than 2 mm. and those less than 2 mm. have been recorded. In Lead I 1,390 (69.5 per cent) had amplitudes greater than 2 mm., in Lead II 1,701 (85.0 per cent) and in Lead III, 774 (38.7 per cent). In Lead III 64 records (3.2 per cent) had negative T waves in excess of 2 mm. (Table V).

U waves.—In many records the presence or absence of a U wave was difficult to determine, particularly in those showing a fast heart rate. In Lead I the U wave was present in 139 records (6.9 per cent), in Lead II 196 (9.8 per cent) and in Lead III only 16 records (0.8 per cent). The presence of the U waves was recorded only in those records which showed a definite rounded wave of low amplitude and relatively long duration consistently following the T wave.

Extra systoles.—One record of pulsus bigeminus was found. This individual was a strong healthy athlete of 21 years of age. The condition had been present and known for many years.

The recording of isolated extra systoles was largely a matter of accident. However, they were observed in 31 records (1.55 per cent). Auricular extra systoles were found in 10 records (0.5 per cent) and ventricular extra systoles in 21 records (1.05 per cent).

Axis deviation.—The definition for left and right axis deviation published by the Criteria Committee of the New York Heart Association[6] was followed in this analysis.

"*Left deviation* of the electrical axis of QRS.—The algebraic sum of the QRS deflections is positive in Lead I. It is negative in Lead III or in Leads II and III depending upon whether the degree of left axis deviation is slight or marked".

"*Right deviation* of the electrical axis.—The algebraic sum of the initial ventricular deflections in Lead I is negative. In Leads II and III this value may be positive, negative in Lead II and positive in Lead III or negative in both depending on the degree of right axis deviation."

It should be pointed out that when axis deviation is determined by use of the Einthoven triangle, as described by White and others, the number of records classed as left axis deviation is somewhat less than when the above standards are used.

There were 299 records (or 14.5 per cent) in category IV, the doubtful abnormal group. Axis deviations constituted 84 per cent of this group, 251 records (12.5 per cent of the series). There were 138 records (6.9 per cent) which showed left axis deviation and 113 (5.6 per cent) which showed right axis deviation. Most clinicians are of the opinion that axis deviation is of no significance in this age group unless associated with other signs of heart disease. No cardiac abnormalities were detected in the routine physical examination of the group investigated. However, a further study is being made to determine possible correlation with the so-called functional murmurs, body build, etc., or with changes in the T1/T3 ratio. The results will be presented in a later paper. Records have already been obtained with the individuals in the recumbent

TABLE V.

	T Wave						*U Wave*
Lead	*Positive*	*Negative*	*Diphasic*	*Absent*	*Greater than +2 mm.*	*Greater than −2 mm.*	*Present*
	percentage	*percentage*	*percentage*	*percentage*	*percentage*	*percentage*	*percentage*
I	99.85	0.10	0.05	0	69.50	0	6.95
II	99.45	0.30	0.20	0.05	85.05	0	9.80
III	71.25	13.60	13.30	1.85	33.70	3.20	0.80

position during quiet respiration, in the expiratory phase and in inspiratory phase; in the sitting position in the various phases of respiration, in the sitting and recumbent position after mild and moderate exercises, etc. The results of this study will also be presented at a later date.

Nine records were placed in Category 5, because of negative T1 or T2 or bundle branch block. The records of the routine medical examination of these men revealed no other abnormal finding, nor did those whose records showed prolonged PR or QRS intervals or diphasic T1 or T2. In a few of these cases a more careful clinical examination and inquiry into the history revealed the presence of some degree of organic cardiac abnormality. These men were not permitted to proceed to flying training. However, those men, who after an additional thorough clinical examination and history, showed no indication of an organic disturbance, other than that found in their electrocardiogram, were allowed to continue in aircrew.

SUMMARY

The gross analysis of the electrocardiograms of 2,000 healthy male adults between the ages of 18 and 32 taken while at rest in the recumbent position has been presented. It is fully appreciated that the value of electrocardiography in diagnosing cardiac conditions is limited. However, the number of records showing axis deviation, abnormalities of the T wave in Leads I and II, and the occurrence of prolonged P-R and QRS intervals, indicate the value of such recordings at least as an indication for more careful investigation before selection for aircrew duties.

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AN IMPROVED RADICAL TECHNIQUE FOR CARCINOMA OF THE EXTERNAL GENITALIA IN THE FEMALE*

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CARCINOMA of the external genitalia, as a rule, occurs in the elderly. It is not a common disease. The affection first appears as an indurated nodule, wart, or ulcer, and in over 50 per cent of cases is preceded by leucoplakic changes in the vulva. In the treatment of this form of cancer the demands of the pathologist are only satisfied when the surgeon removes the primary growth and the lymph glands that drain that area.

The lymphatic drainage of the external genitals is quite rich. The anastomosis across the mid line is very free so that a unilateral lesion can easily infect the glands in both inguinal areas.

There are two groups of inguinal glands; a superficial and a deep. The superficial nodes lie immediately below Poupart's ligament, and number ten to twenty. There are one or two especially large ones over the fossa ovalis. The vulva drains into this group of glands.

The deep glands lie medial to the femoral vein and are commonly known as the "glands of Cloquet". They drain the superficial group, the clitoris, and the urethra. These glands, situated as they are in the femoral ring, are frequently inaccessible. We owe to Basset the unique suggestion of dividing Poupart's ligament for the exposure and removal of these glands. The exposure is excellent, but the restoration afterwards of Poupart's ligament is difficult.

If the patient is thin, the superficial nodes can be felt. In the obese individual they lie incorporated in meshes of fat so that in their surgical removal it is essential that the entire "mass of fat" be removed. This "mass of fat" resembles the letter "T", the horizontal part being that lying below Poupart's ligament; the vertical part that over the saphenous opening.

Most women with cancer of the vulva are poor risks. A lone lesion may easily infect both sides, so it is important that both groins be operated upon. An operative technique devised for rapidity of action and directness of approach is presented in the following series of illustrations.

* Read at the Seventy-first Annual Meeting of the Canadian Medical Association, Toronto, June 20, 1940.