

THE PROGNOSTIC VALUE OF THE ELECTROCARDIOGRAPHIC FEATURES OF CHAGAS' DISEASE

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SUMMARY

The Authors appraise the prognostic value of some of the electrocardiographic signs in subjects with a positive complement fixation test for Chagas' infection. Data on a non-selected group of individuals followed for a period of 18 years is analysed. The fatal cases among this material died on average 6,7 years after the ECG was recorded. In addition the Authors report findings on a group of 566 fatal cases of *T. cruzi* infection, submitted to an electrocardiographic examination at variable times before death. The paucity of findings in the non-fatal cases, which disagrees with some other reports, can probably be explained by the prolonged follow-up. Right bundle branch block, primary S-T changes and multifocal ventricular premature beats were significantly more frequent in the fatal group, but these features are compatible with survival for long periods of time. The presence in Chagas' disease of complete A-V block, left bundle branch block and atrial fibrillation or flutter is suggestive of a reduced life-expectancy, 91%, 100%, and 80% of the subjects respectively presenting these abnormalities expiring within 10 years, and 51%, 76% and 50% within 5 years.

INTRODUCTION

As reported elsewhere by the present Authors³, the prognosis of infection by *Trypanosoma cruzi* seems less dramatic than suggested by the hospital records, when a non-selected population from within the endemic areas is investigated. Thus, in a group of 1,088 individuals presenting a positive complement fixation test for Chagas' disease registered during 1949, 87.7% of those under 30 at the beginning of the follow-up period, and 70.9% of those above that age remain alive in 1967.

Hence positive serology is definitely not an indication of reduced life expectancy. In the present paper the Authors will endeavour to appraise the prognostic implications of the electrocardiographic abnormalities found in Chagas' infection.

MATERIAL AND METHODS

The Authors availed themselves of the clinical and laboratorial data accumulated since 1943 by the late Dr. Emmanuel Dias at the "Centro de Estudos do Instituto Oswaldo Cruz", in Bambuí. In order to meet the requirements of strict non-selection of the human material, only the individuals registered during 1949 were chosen for this study, since during that year a far-reaching survey was carried out in the district. To date 176 deaths have been reported in the 1,088 seropositive individuals. During the intervening 18 years, however, 299 subjects moved to other localities, and 152 cannot be located³. For all practical purposes this group has to be considered similar to the entire material.

The analysis of Table II is based upon 387 ECG'S made on admission, in 1949. The "non-fatal" group is made up of individuals

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still alive and residing in the county. The subjects comprising the "fatal" group died on average 6.7 years after the ECG was recorded.

In addition the initial electrocardiographic findings for 566 seropositive individuals dying in Bambuí since 1943 have been analysed, death from *acute Chagas'* disease having been excluded from the series.

The electrocardiographic features in chronic Chagas' disease having been competently described in a series of papers^{1, 2, 4, 5, 6, 7}, the present Authors will limit themselves to an appraisal of the evolution and prognostic significance of some of these signs, because of their frequency, or by virtue of their unquestionable importance in estimating the risk run by the individual with Chagas' infection. Whereas Table II thus comprises only some of the electrocardiographic findings, a "normal" ECG implied not only in the absence of these features, but of the following as well: P and QRS changes (other than of intraventricular block), cardiac hypertrophy or strain, axis deviation, low voltage of the QRS complex, atrial premature beats, or electrically silent areas of the myocardium.

A P-R interval up to 0.20 seconds, a shift in the S-T segment up to 1 millimeter, sinus arrhythmia, and unifocal ventricular premature beats were considered normal.

A QRS typical of bundle branch block was not included as such in the table when complete auriculo-ventricular block was also present. A configuration of bundle branch block with a QRS complex between 0.10 and 0.12 seconds was considered to represent "incomplete bundle branch block".

RESULTS

Table I reveals a substantial difference in age distribution between the fatal and non-fatal cases of the 1949 group, with a predominance in the latter of the individuals below 30. Table II lists some of the more pertinent electrocardiographic findings in the 3 human groups analysed.

While complete RBBB is listed according to whether this is an isolated finding or occurs associated with other electrocardiographic abnormalities, this subdivision is omitted for the other signs. Briefly, in only 4.7% of the ECG'S presenting multifocal ventricular premature beats was this the sole abnormality to be found, the most common association being with complete RBBB, present in 52.7% of the cases. Primary S-T changes were isolated findings in only 5.5% of the instances where they were found, and atrial fibrillation or flutter occurred alone in 9.8%.

TABLE I

Age distribution of the human material: individuals with a positive CFT for Chagas' infection, and submitted to an electrocardiogram at start of follow-up period

Age (years)	1949 group				All fatal cases	
	Non-fatal		Fatal		Number	%
	Number	%	Number	%		
0-29	140	55.0	39	29.3	202	35.8
30-49	83	32.9	55	41.4	265	46.7
Over 50	31	12.1	39	29.3	99	17.5

TABLE II
Some of the electrocardiographic findings in the human material

Findings	1949 group						All fatal cases					
	Non-fatal			Fatal*			Years before death					
	0-4		5-9		Over 10**		0-4		5-9		Over 10**	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total ECG's	254	100.0	133	100.0	334	100.0	127	100.0	105	100.0	105	100.0
Normal ECG's	155	61.0	37	27.8	20	6.0	28	22.1	33	31.5	33	31.5
1st. or 2nd. degree A-V block	7	2.8	4	3.0	15	4.5	1	0.8	4	3.8	4	3.8
Complete A-V block	0	0.0	10	7.5	54	16.2	16	12.6	3	2.9	3	2.9
Incomplete RBBB	9	3.5	3	2.3	6	1.8	7	5.5	1	1.0	1	1.0
Complete RBBB-all cases	39	15.4	57	42.8	156	46.9	60	47.3	51	48.5	51	48.5
Complete RBBB-isolated	26	10.2	18	13.6	27	8.2	18	14.3	26	24.8	26	24.8
Complete RBBB-associated with other signs	13	5.2	39	29.2	129	38.7	42	33.0	25	23.7	25	23.7
Incomplete LBBB	0	0.0	1	0.8	13	3.9	1	0.8	0	0.0	0	0.0
Complete LBBB	0	0.0	2	1.5	21	6.3	3	2.4	0	0.0	0	0.0
Primary S-T changes	4	1.6	15	11.3	79	23.7	16	12.6	17	16.2	17	16.2
Multifocal ventricular premature beats	13	5.1	53	40.0	196	59.0	54	42.5	38	36.2	38	36.2
Atrial fibrillation or flutter	0	0.0	7	5.3	40	12.0	9	7.1	5	4.8	5	4.8
No. of abnormalities per abnormal EKG	1.5	—	2.0	—	2.1	—	1.6	—	1.5	—	1.5	—

* — Death on average 6.7 years after the recording

** — Average follow-up of 13.2 years

DISCUSSION

Table II indicates that the simultaneous occurrence of two or more electrocardiographic abnormalities is quite frequent in Chagas' disease, not only in the fatal cases but in the subjects who survived the 18 years since the first recording.

A comparison between the first and the last column shows that as early as 13 years before death, on average, electrocardiographic changes are clearly much more frequent in the fatal than in the non-fatal group. The question might be raised whether this difference should not be attributed to the difference in age distribution between the two groups, age rather than Chagas' disease being responsible both for a high death rate and for the increased likelihood of finding abnormal ECG'S. The Authors believe that the influence of age on these findings is minimal. Under no circumstance would one expect to find 70% of abnormal ECG'S in the absence of Chagas' infection, even in older age groups. Moreover, the frequency of RBBB likewise points to the same conclusion: it has been said⁸ that a region endemic for Chagas' disease could be recognized by a prevalence of RBBB higher than 1.5-2.0%, indicating how specific a feature this is. In addition, in *T. cruzi* infection RBBB is frequently associated with other electrocardiographic abnormalities⁷, likewise a commonplace finding in our material. Thirdly, a remarkable disproportion between the prevalence of right and left bundle branch block in an exposed population is said to be characteristic of Chagas' myocarditis⁸, the ratio in our own material being close to 28:1.

The electrocardiographic findings in our non-fatal group are indeed unremarkable when compared to other data in literature^{4, 5}; for instance, LARANJA et al.⁴ and PORTO⁵ respectively reported RBBB in 27.3% and 46.8% of their non-fatal cases. In our opinion this disagreement must probably be ascribed to the fact that we were privileged to work with non-selected human material. Moreover, our follow-up period of 18 years is substantially higher than in other reports, many of the patients with severe myocarditis having already dropped out of the non-fatal group in the intervening years.

Omitting discussion of partial auriculo-ventricular block, as well as incomplete RBBB, both features apparently just as common in severe as in benign Chagas' disease, we will briefly analyse the prognostic significance of some of the findings listed in Table II. Complete auriculo-ventricular block: This complication has been taken as an indication of bad prognosis in Chagas' disease^{1, 5}. Table II illustrates an increasing incidence in the years preceding death: 91% of the subjects in our material did not survive 10 years after complete A-V block was recorded, and 51% died within 5 years. Left bundle branch block: Our data demonstrate that no patient presenting this electrocardiographic feature survived more than 10 years, 76% expiring within 5 years after the demonstration of the lesion. Atrial fibrillation and flutter: This sign has likewise been considered of ominous prognosis in Chagas' myocarditis^{1, 2, 5, 7}. Ten-year survival was 20%, and 5 year survival was 50% in our material.

The above features, useful in predicting prognosis in *T. cruzi* infection when present in the ECG, are too infrequent a finding, and thus cannot be used as sole criteria. Most of the other common electrocardiographic abnormalities are likewise more frequent in fatal cases, but develop too early to afford an insight into the chances for survival. In our material of 1949 RBBB is almost 3 times as common in the fatal cases as in those who survived for 18 years; unquestionably its presence worsens prognosis. However, as Table II indicates, RBBB is compatible with rather long survival, in keeping with the statement⁸ that this feature precedes the other electrocardiographic abnormalities during the evolution of Chagas' myocarditis.

Our data further demonstrate that the prognosis of RBBB is less severe when this is the sole abnormality to be found in the ECG.

Similar conclusions can be drawn with respect to primary S-T changes and multifocal ventricular premature beats. In addition, the data of Table II seem to disclaim the statement^{5, 7} that the latter feature is to be taken as an ominous sign.

While the analysis was handicapped by the difficulty in securing strictly comparable

control groups, the Authors have confessed elsewhere³ their failure in proving that the mortality risk increases in the presence of a positive complement fixation test, whereas it is undeniable that life expectancy is reduced in Chagas' myocarditis. One approach for demonstrating this fact is to compare the age dependent mortality of the Bambuí district (an estimated 24.5% overall prevalence of positive CFT) with the data in Table I. Taking all deaths reported in the town during 1963-66, excluding those before the age of 10 (since the youngest subject in our fatal group was 11 years old), we find that 10% were in the 10-29 age group, 32% were 30-49 years old at time of death, and 58% were older than 50, a distribution quite different from that in Table I.

RESUMO

Implicações prognósticas do eletrocardiograma na doença de Chagas crônica

Os Autores examinam o valor prognóstico de algumas das anormalidades do eletrocardiograma em indivíduos com reação de fixação do complemento positiva para infecção chagásica. São analisados os dados colhidos em um grupo humano não selecionado, e seguido durante um período de 18 anos. As mortes neste material ocorreram em média 6,7 anos após a realização do eletrocardiograma. São ainda descritos os achados em um grupo de 566 casos fatais submetidos a este exame em diferentes períodos antes do óbito. A pobreza dos achados no grupo de sobreviventes, fato que discorda de outras publicações, deverá ser explicado pelo longo período de segmento. Bloqueio de ramo direito, alterações primárias de S-T e a extrasístolia ventricular multifocal são achados mais freqüentes no grupo de fatais, entretanto, são compatíveis com a sobrevida du-

rante período de tempo prolongado. A presença na doença de Chagas de bloqueio A-V completo, bloqueio de ramo esquerdo e da fibrilação auricular ou do flutter indica mau prognóstico, respectivamente 91%, 100% e 80% dos indivíduos falecendo dentro de 10 anos, e 51%, 76% e 50% dentro de 5 anos após êstes achados.

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