

## RELATIONSHIP OF SYMPTOMS TO CARDIAC ARRHYTHMIAS DURING 24 HOURS CONTINUOUS AMBULATORY ELECTROCARDIOGRAPHY

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*We evaluated the relationship between symptoms and arrhythmias occurring during 24 hours continuous ambulatory electrocardiographic monitoring in 1558 patients (790 men and 768 women) aged 13 to 68 years (mean 56,7 yrs). Ventricular arrhythmias were recorded in 886/1558 patients (57%), and supraventricular arrhythmias in 414/1558 patients (26.6%). During the recording period only 32,5% of patients (507/1558) reported symptoms consistent with rhythm disturbances. The incidence of symptoms in patients with and without arrhythmias was not statistically different. Only 16.6% of symptomatic patients 84/507 had symptoms simultaneously with arrhythmias, and patients with minor arrhythmias had a lesser incidence of symptoms than those with major arrhythmias ( $p < 0.001$ ). One hundred and eighty patients had symptoms associated with normal recordings, excluding cardiac arrhythmias as their cause. Women were more symptomatic than men, whether they had arrhythmias or not ( $p < 0.001$ ).*

*Of note, we found a low correlation index between symptoms and arrhythmias in our population. This fact should be taken into account when dealing with patients prone to develop complex arrhythmias, for whom only an adequate evaluation of their underlying pathology with help to choose the appropriate treatment.*

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Long-term continuous ambulatory electrocardiography has been widely used to evaluate patients with symptoms such as palpitations, dyspnea, chest pain, dizziness and syncope<sup>1-6</sup>. The primary goal of monitoring is to detect any correlation between symptoms and electrocardiographic signal abnormalities such as heart rate, rhythm, conduction disturbances and ST segment changes<sup>7-13</sup>. However, symptoms may appear without concomitant electrocardiographic changes and, conversely, electrocardiographic disturbances may occur asymptotically<sup>14-16</sup>.

In this study we evaluated the possible correlation between symptoms and ECG changes in a population of 1558 consecutive patients referred for continuous ambulatory Holter evaluation.

### MATERIAL & METHODS

The records of 1558 consecutive patients (790 men and 768 women) with their activities diaries were reviewed. This is an unselected population referred to our

laboratory for evaluation. Holter indications included: a) evaluation of symptoms such as palpitations, dyspnea, chest discomfort, syncope or dizziness; b) evaluation of arrhythmias in patients with coronary heart disease, cardiomyopathies, valvular heart disease, hypertension and c) control of antiarrhythmic treatment efficacy.

Patients' ages ranged from 13 to 86 years (mean 56,7 yrs). They were classified according to the data submitted by the referring physician (table I).

Irrespective of their diagnosis, 463 patients (29,7%, 217 man and 246 women) referred symptoms considered as due to cardiac arrhythmias in the pre-test anamnesis.

All patients were equipped with a dual channel 24 hours recorder MR 20 (Oxford Medical Systems, London, U. K.), utilizing bipolar lead systems with the exploring electrodes in conventional leads V1 and V5. Prior to leaving the laboratory, each patient was instructed how to use the diary to note symptoms and activities.

TABLE I - Clinical diagnosis of 1558 consecutives patients.

	%	men	women
Coronary heart disease	375 24.0	267	108
Cardiomyopathy	87 5.6	36	51
Valvular heart disease	109 7.0	31	78
Hypertensive heart disease	101 6.5	38	63
Conduction disturbances	170 10.9	87	83
Other arrhythmias or drug test	350 22.5	161	189
Miscellaneous heart diseases	28 1.8	12	16
Non-diagnosed	338 21.7	158	180
	1558 100	790	768

Arrhythmias were defined as follows: A) supraventricular arrhythmias - A1) atrial premature beats, A2) paroxysmal supraventricular arrhythmias (paroxysmal supraventricular tachycardia, atrial fibrillation, atrial flutter, or junctional accelerated rhythm), A3) second or third degree A-V block. B) ventricular arrhythmias - B1) isolated ventricular premature beats (VPB), less than 30/hour, B2) frequent VPB (more than 30/hour), B3) multiform, VPB, B4) VPB in couplets and B5) ventricular tachycardia. (more than 3 VPB).

Groups A2, A3, B2, B4 and B5 were considered major arrhythmias.

All tapes were analyzed using standard analytic techniques (Medilog Analyzer HL 15 EM, Oxford Medical Systems, London, U. K.) and representative arrhythmias were printed out in real time. Monitors had direct electronic markers allowing accurate recording and synchronous correlation of symptoms to ECG records. Any ECG abnormality occurring within 5 minutes of a symptom was considered to be related to it.

Statistical analysis was performed using the Chi square test (X<sup>2</sup>).

RESULTS

a) **Electrocardiographic monitoring:** Ventricular arrhythmias were recorded in 886 patients. They were the only abnormalities in 638 patients and were associated with supraventricular arrhythmias in the remaining 248.

Supraventricular arrhythmias were recorded in 414 patients; in 166, they were the only finding.

For the whole group, 1052 patients (67,5%) had detectable arrhythmias, of which 34% were major ventricular arrhythmias and 8.8% major supraventricular ones.

b) **Symptoms:** Of the 507 patients who reported one or more symptoms during monitoring, 188 (37%) had no arrhythmias, 195 (37,5%) had ventricular arrhythmias, 49 (9,7%) had supraventricular arrhythmias and 75 (14,8%) had both types of rhythm disturbances.

Correlation between symptoms and ECG findings are shown in figure 1.

There were no statistically significant differences in the incidence of symptoms in patients with and without arrhythmia.

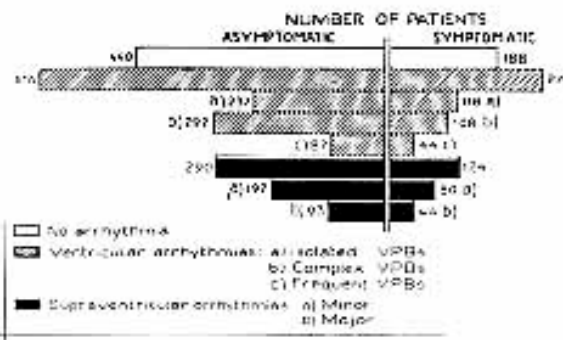


Fig. 1 - Incidence of ventricular and supraventricular arrhythmias on patients with and without symptoms.

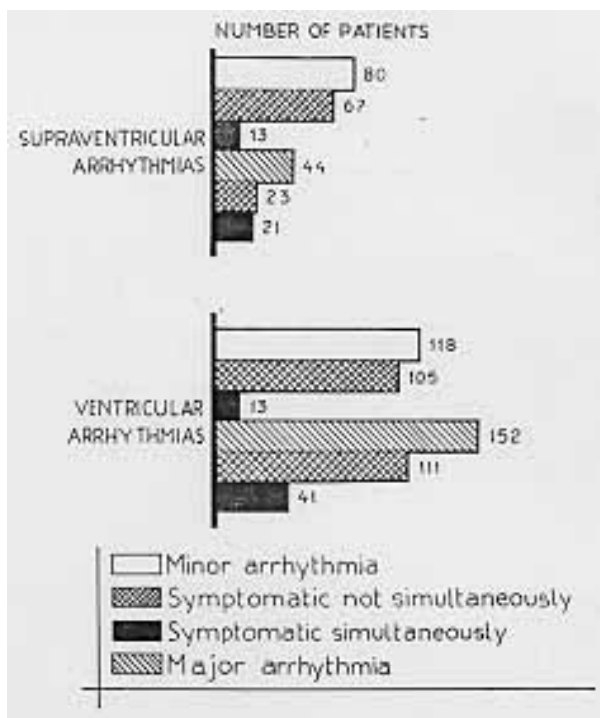


Fig. 2 - Incidence of symptoms in patients with ventricular and supra-ventricular arrhythmias according to the simultaneous occurrence of arrhythmia.

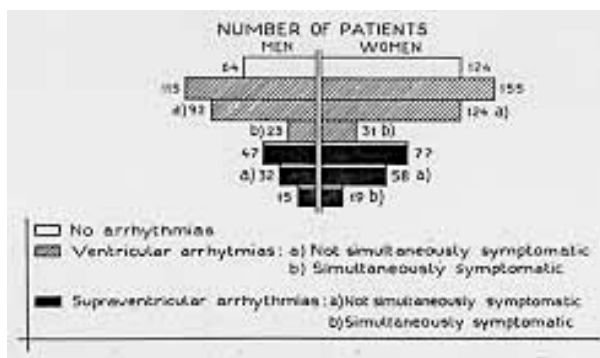


Fig.3 - Incidence of symptoms according to sex in patients with ventricular and supra-ventricular arrhythmias.

Only 84 patients (16,6%) referred symptoms simultaneously with a an arrhythmia. When time correlation

between symptoms and arrhythmia was considered, we found that:

a - patients with grade 1 ventricular arrhythmia had a greater incidence of symptoms without simultaneous arrhythmia and a lesser incidence concomitantly with arrhythmia. In patients with major arrhythmias findings were opposite ( $p < 0.005$ ) (fig. 2).

b - for patients with supraventricular arrhythmias, those with minor rhythm disturbances had a lower incidence of simultaneous symptoms, while patients with major arrhythmias had a greater incidence of concomitant symptoms ( $p < 0.001$ ) (fig. 2).

When relationship between symptoms and sex was checked out, we found that women were more symptomatic than men, whether they had arrhythmias or not ( $p < 0.001$ ), and irrespective of their type ( $p < 0.005$ ) (fig. 3).

Symptom sensitivity to detect cardiac arrhythmias confirmed by Holter was 62,9% in our population, and specificity was lower (42%). Positive predictive value was 48%.

Regarding severe arrhythmias and symptoms relationship, syncope or near syncope, dizziness, dyspnea and palpitations were the most frequent. Only patients suffering from major arrhythmias received specific treatment. Several drugs were used namely: (600 mg/day), mexiletine (600 mg/day), tocainide (400 mg/day) and flecainide (400 mg/day). Amiodarone was selected in 75% of patients as the first line antiarrhythmic drug. In patients presenting with major arrhythmias and syncope or near-syncope the association amiodarone-mexiletine was also used. No antiarrhythmic drug-induced severe arrhythmias was observed in our series. In all instances specific treatment was administered after the 24 hour-ambulatory monitoring ECG, being its results carefully evaluated.

## DISCUSSION

Patients presenting with transient symptoms of cardiac origin represent a usual problem in clinical practice, and even if physicians have long appreciated the importance of diagnosing arrhythmias, their association with symptoms<sup>1, 2, 5, 6, 15, 16</sup> and sudden death have been only recently understood<sup>17-19</sup>.

**Incidence of arrhythmias:** Of our 1558 consecutive patients, 886 (57%) had ventricular and 414 (26,6%) supraventricular arrhythmias. Because some of them had both types of arrhythmias, a total of 1052 patients (67,5%) demonstrated arrhythmias during Holter monitoring.

Hinkle et al<sup>14</sup>, in a random sample of 301 actively employed asymptomatic men with a mean age of 55 years, reported a 62.2% incidence of ventricular arrhythmias and a 76% supraventricular arrhythmias during a 6 hour period of ordinary activity. Zeldis et al<sup>16</sup> found 70% of ventricular and 44% of supraventricular arrhythmias in 447 symptomatic patients who underwent 24 hour ECG monitoring. The incidence of VPB in couplets and ventricular tachycardia was

of 12,7% and 3,2% in Hinkle's series, of 19% and 8% in Zeldis' group and of 14,4%, and 5,6% respectively in our series.

Our findings fall among those of both previously mentioned reports, even though there are differences in the type of population, the recording time and the incidence of antiarrhythmic treatment, that may have suppressed VPB<sup>20</sup>.

The incidence of major forms of supraventricular arrhythmias such as supraventricular tachycardia and A-V block was only 5,2% and 0,7% in Hinkle's report<sup>14</sup>. compared to 7,5% and 1,2% respectively in the present study. Zeldis found a lesser overall incidence of supraventricular arrhythmias compared to Hinkle, but it was higher than ours, and with no cases of A-V block<sup>16</sup>.

Differences in overall incidence may be due to analysis techniques<sup>21</sup> or to a tendency of the Avionics 660 analyzer to report supraventricular ectopic beats when heart rate suddenly increases<sup>22</sup>.

**Symptoms and arrhythmias:** Holter ECG monitoring helps to establish a correlation between symptoms and arrhythmias in an ambulatory population. However, results are controversial. Lipsky et al<sup>3</sup> evaluated patients with syncope, dyspnea, or palpitations, and found a 55% incidence of arrhythmia, of which 21% were bradycardias occurring during sleep. Goldberg et al reported an incidence of 74% of arrhythmias in 130 patients with syncope, dizziness or palpitations. Of note, in their study many patients had more than one 24 hour monitoring session, and attempts to determine a temporal relationship were not satisfactory due to technical difficulties. Walter et al<sup>2</sup>, in a selected group of patients with symptoms of cerebral ischemia found 26% of major arrhythmias, the majority of which correlated with symptoms.

In our study 507 patients (32,5%) experienced syncope, near-syncope, dyspnea, palpitation or chest pain during ECG monitoring. Their incidence of arrhythmia was similar to that of patients who remained asymptomatic during evaluation. Our results are similar to those of Clark et al<sup>15</sup>, who studied 98 patients referred for evaluation of dizziness or syncope and found 42% of symptoms during monitoring. There were no statistically significant differences in the incidence neither in the type of arrhythmia, whether patients referred symptoms or not. We found no significant differences in the incidence of symptoms when patients with and without arrhythmias were compared.

These data raise serious doubts about the significance of symptoms as indicative of cardiac arrhythmias in a large population. Symptoms may be related to other factors such as physical activity, body position, blood pressure, blood volume or anxiety. Thus, symptom may appear without rhythm disturbances, and the same arrhythmia may not always cause, the same symptom, if any. A final conclusion as to whether symptoms are due to cardiac arrhythmias or not can

only be drawn when they occur with or without an arrhythmia.

However, simultaneous occurrence of symptoms and arrhythmias is rarely found. In our study only 84 patients (16,6% of the symptomatic group) had symptoms concomitantly with an arrhythmia. Similar data have been reported by Kennedy et al<sup>23</sup>, with 9% of their patients with coronary heart disease reporting symptoms during maximal ventricular ectopic rate. In addition, 13% of patients reported by Zeldis et al<sup>16</sup> had symptoms concomitantly with arrhythmia. In our group, patients with minor arrhythmias had a lesser incidence of concomitant symptoms than patients with major ones.

We also found that women were more symptomatic during ECG monitoring than men, whether they had arrhythmias or not. So far, we found no explanation for this finding.

Of note, asymptomatic arrhythmias in this study have been classified as significant by other authors<sup>12, 18, 27, 36</sup>, due to their prognostic value. Ventricular tachycardia, frequent, multiform and paired VPB have been associated with sudden death in patients with coronary heart disease<sup>18, 26</sup>, hypertrophic cardiomyopathy<sup>27</sup> and other heart diseases<sup>17, 19</sup>. In a previous study<sup>28</sup> we also found that only 2/144 episodes (1,4%) of ventricular tachycardia recorded in 30 ambulatory patients were symptomatic.

This study confirms the usefulness of ambulatory ECG monitoring for the detection of cardiac arrhythmias. However, there was a low correlation index between symptoms and arrhythmias and, vice-versa, in a large population. Symptoms may occur without arrhythmias, and major arrhythmias may occur without symptoms. Physicians should be aware of this fact in patients prone to develop serious arrhythmias and sudden death. Only an adequate correlation between the underlying cardiac disorder, they symptoms and the type of arrhythmias recorded will allow to choose the appropriate treatment. These arrhythmias may be satisfactorily controlled with new antiarrhythmic drugs<sup>20, 27</sup> and perhaps, to some extent, sudden death prevented.

## RESUMO

A relação entre os sintomas e as arritmias que ocorrem durante monitoragem eletrocardiográfica ambulatorial contínua de 24 horas foi avaliada em 1558 pacientes, sendo 790 do sexo masculino e 768 do feminino, com idades entre 13 e 68 anos (média 56,7 anos),

Arritmias ventriculares foram registradas em 886 pacientes (57%) e supraventriculares em 414 deles (26,6%). Durante o período de registro, apenas 507 pacientes (32,5%) referiram sintomas correlacionados com a disritmia.

A incidência de sintomas naqueles com ou sem arritmias não era estatisticamente diferente. Apenas

16,6% dos pacientes sintomáticos (84 de 507) apresentaram, sintomas simultaneamente à arritmia; os pacientes com arritmias de pouca importância tiveram uma incidência menor de sintomas que aqueles com disritmias mais relevantes ( $p < 0,001$ ). Também 188 pacientes apresentaram sintomas durante ritmo normal, cujas causas não eram arritmias cardíacas. As mulheres queixaram de mais sintomas, sejam eles arritmias ou não ( $p < 0,001$ ).

Assim, verificamos uma correlação baixa entre sintomas e arritmias na nossa casuística. Esse fato deve ser lembrado quando lidamos com pacientes com tendência a arritmias complexas, onde a avaliação adequada de sua doença de base poderia auxiliar na opção do tratamento apropriado.

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