Occurrence of Frequent Complex Arrhythmias Detected by Ambulatory Monitoring*

Findings in an Apparently Healthy Asymptomatic Elderly Population

Stephen P. Glasser, M.D.; Pamela I. Clark, R.N.; and Hal J. Applebaum, M.D.

In order to delineate the frequency of arrhythmias and conduction abnormalities in a group of apparently healthy elderly people, 24-hour ambulatory ECG recordings were obtained on subjects recruited from the Veterans Administration Voluntary Service. Their ages ranged from 60-84 (average 69). It is concluded from this preliminary study that complex supraventricular and ventricular arrhythmias occur in an apparently healthy elderly population. These findings must be taken into account in assessing the clinical significance of arrhythmias in an elderly population.

Ambulatory (Holter) monitoring has been available for clinical use since 1962.† It has been utilized in the assessment of complaints such as dizziness, palpitations and syncope, as well as for a variety of other circumstances. In general, arrhythmias occur concomitantly during ambulatory monitoring, there is generally little question as to cause and effect, but when symptomatic patients have arrhythmias during monitoring unassociated with their complaint, a particular note of caution is warranted. Here cause and effect may be implied but remain unproved, particularly since most patients do not perceive the majority of documented cardiac ectopic beats they experience. Indeed, we have recently reported the lack of correlation of symptoms of dizziness and syncope with arrhythmia in an unselected group of patients referred for ambulatory monitoring. In order to adequately judge the significance of arrhythmias and conduction abnormalities encountered in a symptomatic population, we felt that further investigation of the incidence of arrhythmias in a normal elderly population (the least studied group) was necessary. Towards that end, we recruited a group of apparently healthy asymptomatic, elderly people (members of the Veterans Administration Voluntary Service) on whom we obtained 24-hour ambulatory recordings.

METHODS

Apparently healthy people over the age of 60 were recruited from the Veterans Administration Voluntary Service. In order to eliminate some bias in selection, 15 subjects were randomly chosen from a group of active asymptomatic individuals who were not taking medications known to have cardiovascular effects and whose resting ECGs and chest x-ray films showed normal findings. Two subjects were dropped from the study. On further screening one was found occasionally to take meprobamate (an unlikely but potentially arrhythmogenic agent) and the other because a subsequent ECG demonstrated borderline first degree A-V block. This left a study population of 13 subjects.

In each, 24-hour ambulatory ECG recordings were obtained (Fig 1). The subjects were equipped with dual channel recorders (Avionics model 450), utilizing bipolar lead systems with the exploring electrodes in the V1 and V6 positions. Prior to leaving the laboratory, each patient was given a diary for notation of symptoms and activities and carefully instructed in its use and importance. When removing the monitor at the end of the recording period, we again carefully interviewed the subjects about their symptoms and activities. The tapes were analyzed by one of the authors using an Avionics model 680A dynamic electrocardiograph and model 670A DCG computer control module. Electrocardiographic data were assessed by direct visualization utilizing the computer assist.

RESULTS

Seven of the study group were men and six were women. The ages ranged from 60-84 years with an average age of 69. Complex arrhythmias were found in 10 of the 13 subjects.
Ventricular Arrhythmias

Table 1 summarizes the ventricular ectopic beats (VE) observed. From this table it can be seen that two subjects had greater than 30 unifocal ventricular ectopic beats per hour (Lown classification 2), one had multiform VPBs (Lown classification 3), and three subjects had ventricular couplets (Lown classification 4A). No volleys were seen.

Supraventricular Arrhythmias

Table 1 also summarizes the supraventricular ectopic beats (SVE). Seven subjects were noted to have volleys consisting of 3 to 32 beat runs of atrial tachycardia (Fig 2). These occurred at relatively slow rates (100-155 bpm) with three episodes at rates less than 130 bpm. Thirty-two episodes occurred in these seven subjects with 19 occurring during sleeping periods. Table 2 relates the multiple ventricular and supraventricular beats to sleep periods.

Other Abnormalities

Table 3 summarizes other abnormalities observed during the 24-hour monitoring period. Interestingly, and in contrast to the study by Brodsky et al, no subjects demonstrated severe sinus bradycardia or heart block. An ectopic atrial or junctional rhythm was seen in two subjects. Two subjects had transient ventricular ectopic beats.

![Figure 1](https://example.com/fig1.png)

**Figure 1.** An example of a multiform pair of ventricular ectopic beats seen in asymptomatic elderly subjects.

![Figure 2](https://example.com/fig2.png)

**Figure 2.** An episode of atrial tachycardia (rate 140) which occurred during sleep.

Table 1—Elderly Subjects with Ectopic Beats

<table>
<thead>
<tr>
<th>Modified Lown Class</th>
<th>Ventricular</th>
<th>Supra-Ventricular</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (0-5)</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>1 (&lt;30/hour)</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>2 (&gt;30/hour)</td>
<td>2</td>
<td>2*</td>
</tr>
<tr>
<td>3 (multiform)</td>
<td>1</td>
<td>NE</td>
</tr>
<tr>
<td>4A (couplets)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4B (volleys)</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>

*One subject had >22,000 APBs
NE = not evaluated

<table>
<thead>
<tr>
<th>Increase in Frequency</th>
<th>Decrease in Frequency</th>
<th>No change with sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular ectopic beats</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Supraventricular ectopic beats</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2—Effect of Sleep Periods on Ectopic Beat Frequency in Elderly Subjects
ARRHYTHMIAS

Table 3—Number of Elderly Subjects with Additional Electrocardiographic Abnormalities

<table>
<thead>
<tr>
<th>Arrhythmia</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe sinus bradycardia</td>
<td>0</td>
</tr>
<tr>
<td>A-V block</td>
<td>0</td>
</tr>
<tr>
<td>Ectopic junctional rhythm</td>
<td>1</td>
</tr>
<tr>
<td>Significant sinus arrhythmia</td>
<td>6</td>
</tr>
<tr>
<td>Slow ectopic atrial rhythm</td>
<td>1</td>
</tr>
<tr>
<td>V1 S-T segment depression</td>
<td>2</td>
</tr>
<tr>
<td>V1 T wave inversion</td>
<td>1</td>
</tr>
</tbody>
</table>

S-T segment depression, and one person had episodic T wave inversion (assessed using the bipolar V1 lead only).

Table 4 tabulates results of ambulatory monitoring of normal subjects, adapted from recent studies along with the results of the present study.

DISCUSSION

Subjects afflicted with dizziness, syncope, and palpitations often present a considerable diagnostic problem. Longterm ambulatory Holter monitoring has become a popular technique for the evaluation of transient symptoms of possible cardiac origin. Several reports in the literature have advocated the use of Holter recordings, demonstrating the high prevalence of major arrhythmias in symptomatic populations. However, those reports have often failed to establish strong cause and effect relationships between arrhythmias recorded and symptoms reported. Here, a particular note of caution is warranted since cause and effect may be implied but unproven.

There is little information about the incidence of arrhythmias in normal asymptomatic populations by which to judge the significance of arrhythmias in abnormal groups, since ambulatory ECG studies of apparently healthy persons have been limited and sparsely reported. Brodsky et al performed 24-hour ambulatory monitoring in 50 male medical students without cardiovascular disease and found 50 percent with premature ventricular beats. In 12 percent they were multiform and 6 percent demonstrated the R on T phenomenon. One subject (2 percent) had an episode of ventricular tachycardia. In addition, 56 percent demonstrated atrial premature beats and 6 percent had type 1 second degree A-V block. Hinkle et al evaluated an older group (median age 55 years) and found 62 percent with ventricular and 76 percent with atrial arrhythmias. Many of these arrhythmias would currently be defined as complex. Clarke et al studied 86 clinically normal subjects (age range 16-65) and discovered 12 percent with rhythm disturbances widely believed to be of serious prognostic significance. In addition, 63 of the 86 subjects had some form of ventricular ectopic beats.

Brodsky et al required a normal echocardiogram for inclusion in their study group. We did not feel this was appropriate in our group of elderly subjects because of the known high incidence of calcific mitral annular disease in the usual elderly patient being referred for ambulatory monitoring. Also, unlike the study by Hinkle et al, our subjects were encouraged to perform their routine daily chores rather than to use the artificial situation of a six-hour period in which unusual cardiac stress was programmed. Thus, we feel that our study population represented an elderly asymptomatic group free of clinical evidence of disease. Although more elaborate cardiovascular workup and even cardiac catheterization would have been of interest, the intent of our study was not to define the incidence of disease in an apparently normal population; nor did we feel justified to study further a clinically asymptomatic group. Rather, our intent was to compare the ambulatory ECG findings of an elderly asymptomatic population group to serve as a basis for comparison of ambulatory ECG findings in a symptomatic group.

We found that only 1 of 13 people had an essentially "normal" recording (fewer than five ventricular ectopic beats and five supraventricular ectopic beats per 24 hours). Five of the 13 subjects had complex ventricular arrhythmias (more than 30 ventricular ectopic beats/minute, multiform ventricular ectopic beats, or ventricular ectopic couples), and 7...
of 13 demonstrated complex atrial arrhythmias. These 7 had 31 episodes of asymptomatic "slow" atrial tachycardia. This latter finding is of particular interest in regard to the recent reports of benign slow paroxysmal atrial tachycardia reported by Stemple et al and the report of Lesser on atrial tachycardia in acute myocardial infarction. In these studies, the occurrence of atrial tachycardia detected in a group of patients following acute myocardial infarction was described. Both implied that this arrhythmia might be a marker of cardiac disease. Our results suggest that this arrhythmia is at least as common in clinically normal elderly individuals.

It is concluded from this preliminary study that complex supraventricular and ventricular arrhythmias occur in an apparently healthy elderly population. These findings must be taken into account when assessing the clinical significance of arrhythmias in a symptomatic elderly population.

REFERENCES

6 Glasser SP, Clark PI, Spoto E: Lack of correlation of symptoms of dizziness and syncope with arrhythmias detected by ambulatory monitoring. (Abstract) VIII World Congress of Cardiology, Tokyo, Japan, September, 1978

Clinical Application of Hyperbaric Oxygen

The Fourth Annual Conference on the Clinical Application of Hyperbaric Oxygen will be held June 7-9 at Memorial Hospital Medical Center, Long Beach, California under sponsorship of the hospital.

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