Arrhythmias Detected by Ambulatory Monitoring*

Lack of Correlation With Symptoms of Dizziness and Syncope

Pamela I. Clark; Stephen P. Glasser, M.D.; and Edward Spoto, Jr., M.D.

The correlation of symptoms (SX) with major arrhythmias (ARS) occurring during 24-hour ambulatory monitoring (AM) was investigated in a group of patients referred because of dizziness or syncope. Ninety-eight consecutive patients, ages 25 to 82, who had adequate diaries of activities and SX, were included. The ARS considered to be major were ventricular and supraventricular ectopy grade 2, 3, and 4 (Lown classification), sinus arrest and block, atrioventricular block, and sinus bradycardia ≤ 40/min. Although all patients were referred because of dizziness and/or syncope, only 41 (42 percent) had their symptoms during the recording period. The ARS were recorded in 63 (64 percent). There was no statistically significant difference in the incidence or in the type of ARS in the group with, and the group without, symptoms (x² = 1.64). Of the 23 subjects with both major ARS and recorded SX, only two had SX and ARS occurring concomitantly. It is concluded that (1) this is a group with a high prevalence of major ARS, (2) there was correlation between major ARS recorded and SX reported in a very small percent of cases (2 percent), (3) treating the ARS in the others could not be expected to abolish the SX, and (4) the high cost of monitoring should be considered in this context.

Subjects afflicted with dizziness and syncope often present a considerable diagnostic problem. Long-term 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.

In an attempt to assess the value of ambulatory monitoring in patients with dizziness and syncope, we examined the records of 98 consecutive patients with these symptoms who were referred for Holter monitoring and who had adequate diaries of symptoms and activities.

*From the Division of Cardiovascular Medicine, Department of Internal Medicine, University of South Florida College of Medicine, and the James A. Haley Veterans Administration Hospital, Tampa, FL. Presented at the VIII World Congress of Cardiology, Tokyo, September 17-23, 1978.

Manuscript received November 15; revision accepted August 21.

Reprint requests: Dr. Glasser, Division of Cardiovascular Medicine, University of South Florida College of Medicine, Tampa 33612

Materials and Methods

The records of 98 consecutive patients with adequate diaries of activities and symptoms were included. This represented an unselected population referred to our cardiac noninvasive laboratories from the medical and surgical services. These patients had varying degrees of previous diagnostic workup which had failed to demonstrate to the referring physician a probable cause for the symptoms. This diagnostic workup, performed and recorded by the referring physician, included at least a history and physical examination, a resting ECG, chest x-ray film, and usual blood and urine analyses. Monitoring was requested in all cases specifically for evaluation of symptoms of dizziness and/or syncope.

The subjects were equipped with dual channel, 24-hour recorders (Avionics, Model 450), utilizing bipolar lead systems with the exploring electrodes in the V₃ and V₅ positions. Prior to leaving the laboratory, each patient was given a diary for notation of symptoms and activities and was carefully instructed in its use and importance. It is our practice, also, when removing the monitor at the end of the recording period, to question the patient about symptoms and activities during the preceding 24 hours. The tapes were analyzed by, or under direct supervision of, one of the authors using an electrocardioscanner (Avionics Model 600A) and a DCG computer control module (Model 670A DCG). The ECG data was assessed with direct visualization and additional computer assistance.

Ectopic beats were graded according to the Lown classification as follows: grade 0, no ectopic beats; 1, fewer than 30
Table 1—Arrhythmias Recorded in Subjects Referred Because of Syncope or Dizziness

<table>
<thead>
<tr>
<th>Subjects with symptoms during AM (group 1)</th>
<th>Subjects without symptoms during AM (group 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number = 4</td>
<td>Number = 57</td>
</tr>
<tr>
<td>Sinus Arrest or Block</td>
<td>Sinus Brady 40/min A-V Block</td>
</tr>
<tr>
<td>Max VE Grade 0-1B</td>
<td>Max VE Grade 2-4B</td>
</tr>
<tr>
<td>Max SVE Grade 0-1B</td>
<td>Max SVE Grade 2-4B</td>
</tr>
<tr>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>27</td>
<td>14</td>
</tr>
<tr>
<td>29</td>
<td>28</td>
</tr>
<tr>
<td>36</td>
<td>21</td>
</tr>
</tbody>
</table>

VE = ventricular ectopy; SVE = supraventricular ectopy.

unifocal ectopic beats/hr; 2, greater than 30 unifocal ectopic beats/hr; 3, multifocal ventricular ectopic beats; 4a, couplets; 4b, salvos; and 5, early ectopic beats (not considered in this study). They were considered major if ventricular or supraventricular grades 2, 3, or 4 (greater than 30 per hour, multif orm or occurring in volleys) were noted. Other arrhythmias considered major were sinus bradycardia equal to or fewer than 40 beats per minute, sinus node arrest or exit block, and any other atrioventricular (A-V) block except first degree. Any significant arrhythmias within 30 minutes of symptoms were considered to be causally related.

**Results**

The patients' ages ranged from 25 to 82 (average 57). Although all patients were referred because of dizziness and/or syncope, only 41 (42 percent) had their symptoms during the recording period (group 1) while 57 (58 percent) were asymptomatic during the recording period (group 2).

**Group with Symptoms (Group 1)**

In this symptomatic group, 23 (56 percent) had one or more major arrhythmias during ambulatory monitoring. This included two cases of sinus bradycardia, two instances of second degree (Wenckebach) A-V block, 14 instances of grade 2-4B ventricular arrhythmia and 14 instances of grade 2-4B supraventricular arrhythmia (Table 1). In only three cases did the arrhythmia detected bear any temporal relationship to the symptom reported. One of these cases was that of a 75-year-old man who, during his monitoring period, while standing in the presence of his physician, had a syncopal spell. The alert house officer activated the event marker on the recorder. Later analysis of the tape revealed an episode of atrial flutter with 1:1 conduction occurring several minutes prior to the syncopal episode. Immediately prior to and during the spell, as identified by the event artifact, sinus rhythm was present. Subsequent supine and upright blood pressure determinations revealed marked orthostatic hypotension. In two other cases, a causal relationship between symptoms and arrhythmia were noted. In one, episodes of atrial tachycardia (rates > 180 bpm) were associated with dizziness. In the other case, dizziness was accompanied by sinus slowing and a junctional escape rhythm at a rate of 20 to 30. Interestingly, subsequent “challenge” with a hypodermic needle resulted in the same rhythm so that this second subject probably suffered from vaso-vagal syncope.

**Group Without Symptoms (Group 2)**

This group had higher incidence of major arrhythmia (70 percent) and included two cases of sinus bradycardia, three cases of A-V block, 28 instances of 2-4B ventricular arrhythmia, and 21 instances of grade 2-4B supraventricular arrhythmia (Table 1).

Table 2 summarizes the findings in the two groups by comparing the presence or absence of arrhythmia with the occurrence of symptoms during the monitoring period. Note the similarity between the groups with both symptoms and arrhythmias, with symptoms but no arrhythmias, without symptoms but with arrhythmias, and with neither symptoms nor arrhythmias.

In order to further assess both group 1 and 2 patients, more rigid (albeit arbitrary) definitions of “significant arrhythmia” were analyzed. Thus, when only grade 3 and 4 arrhythmias were regarded as “significant,” χ² was 1.55; and, when only grade 4 arrhythmias were significant χ² was 2.68, neither of which were significant at the 0.10 level.

Table 2—Relationship of Arrhythmias Recorded to Symptoms Reported in Subjects With Dizziness and Syncope*

<table>
<thead>
<tr>
<th>Recorded SX</th>
<th>Recorded No SX</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major AR</td>
<td>23</td>
<td>40</td>
</tr>
<tr>
<td>No Major AR</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>57</td>
</tr>
</tbody>
</table>

*χ² = 1.64; not significant at 0.2 level.
DISCUSSION

Since the early 1960s, the field of ambulatory monitoring has expanded, and it is now used for the detection of abnormalities in rate, rhythm, conduction, and ST segment shifts. Several studies have suggested that ambulatory monitoring has found one of its greatest uses in the investigation of syncope and dizziness, reporting that approximately one half of subjects referred because of symptoms of dizziness and syncope have arrhythmias.

There are several problems apparent in these studies. Lipski et al. found major arrhythmias during AM in 55 percent of 55 patients studied because of symptoms of dizziness, syncope, or palpitations. But, 21 of the arrhythmias were bradycardias which occurred during sleep, and one "major arrhythmia" consisted of a "slow ventricular tachycardia." In the study by Walter et al., a highly selected population was studied in that it included patients with symptoms compatible with true transient ischemic attacks. During a 10-hour monitoring period, 26 percent manifested a major arrhythmia. (Extrapolating to a 24-hour AM, this could again represent an approximate 50 percent to 60 percent arrhythmia incidence). Tabatznik also noted some form of arrhythmia incidence of 53 percent in 119 patients with symptoms of syncope or near syncope. These reports corroborate our results, emphasizing that about one-half of patients referred for ambulatory monitoring because of symptoms of dizziness and syncope have a major arrhythmia (Table 3).

Previous reports, however, have usually failed to establish a strong temporal relationship between recorded arrhythmias and reported symptoms. One that did establish that relationship was the study by Walter et al. in which seven of ten arrhythmias occurred at a time when the patient was having symptoms. In most other reports, the implication is that although symptoms and arrhythmias did not occur concomitantly, the occurrence of a major arrhythmia in a symptomatic patient suggests cause and effect. Analysis of our contingency table (Table 2) is against this conclusion.

In order to further assess the meaning of our data, we looked at several studies dealing with the incidence of arrhythmias in asymptomatic populations. Brodsky et al. performed 24-hour AMs on 50 male medical students, aged 23 to 27, who had a normal history, physical examination, resting ECG, and chest x-ray film. Fifty-six percent demonstrated some form of atrial arrhythmia, 50 percent some form of ventricular arrhythmia (with one instance of ventricular tachycardia), six instances of multifocal ventricular premature beats, and three cases of R-on-T ventricular ectopic beats. In addition, three cases of second degree, type 1 A-V block were noted. Hinkle et al., in an older age group (median age 55), demonstrated an even higher incidence of supraventricular dysrhythmia (76 percent), and ventricular dysrhythmia (62 percent) in 291 six-hour AMs. Raftery and Cashman surveyed 53 normal ambulant subjects without clinical cardiovascular disease and demonstrated an increasing incidence of ectopic activity with advancing age, although few of the arrhythmias found in their subjects would qualify as complex. Clarke et al. studied 86 clinically normal subjects and discovered 12 percent with rhythm disturbances widely believed to be of serious prognostic significance, and 63 of their 86 subjects had some form of ventricular ectopic beats. Finally, in a study from our laboratories, clinically healthy, asymptomatic elderly subjects had a 77 percent incidence of complex arrhythmias. It would thus appear that a significant incidence of arrhythmias is found in populations of apparently normal subjects—at least in subjects without symptoms of dizziness or syncope. It is apparent, therefore, that the incidence of arrhythmias in asymptomatic populations is as high as the incidence in symptomatic groups. These data raise serious questions about the implication of asymptomatic disturbances of rhythm in otherwise symptomatic populations.

Some problems that are inherent in attempting to apply these principles to individual cases, and that point out the frustrations in evaluating such patients, are apparent in the following two illustrative cases:

Table 3—Incidence of Significant Arrhythmias Detected by Ambulatory Monitoring in Patients With Syncope and Dizziness

<table>
<thead>
<tr>
<th>Study</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Study</td>
<td>63/98</td>
<td>64</td>
</tr>
<tr>
<td>Boudoulas et al. (1976)</td>
<td>63/119*</td>
<td>53</td>
</tr>
<tr>
<td>Lipski et al. (1976)</td>
<td>30/55†</td>
<td>55</td>
</tr>
<tr>
<td>Tabatznik (1976)</td>
<td>48/80</td>
<td>60</td>
</tr>
<tr>
<td>Walters et al. (1976)</td>
<td>10/39†</td>
<td>26‡</td>
</tr>
</tbody>
</table>

*All had cardiovascular disease.
†Included 11 patients with palpitations.
‡Only 10-hour monitoring.

724 CLARK, GLASSER, SPOTO

CHEST, 77: 6, JUNE, 1980
A 37-year-old man was referred for ambulatory monitoring because of symptoms of dizziness and chest pain. Analysis of his diary revealed multiple notations of dizziness. Holter monitoring disclosed normal sinus rhythm with rare VPBs, even during periods of dizziness. However, a graded exercise test resulted in a bout of ventricular tachycardia, associated with dizziness which he felt to be identical to that experienced during ambulatory monitoring. We have found this problem of conflicting subjective complaints to be nearly as common in this population as it is known to be in those subjects with palpitations.

In addition to these interpretive problems, and the major technical problems of precise timing of events, we feel it is important to consider the cost of long-term monitoring, which ranges between $75 and $250 per 24-hour recording. This high cost must be weighed against the benefits achieved. More careful screening of patients with dizziness and syncope before obtaining ambulatory monitoring would undoubtedly produce a higher association of symptoms and arrhythmias. Since most patients in most institutions who are referred for AM are from general medical services (as was the case in the population evaluated in this study), the cost effectiveness and logistics of subspecialty preevaluation compared to that of AM without such evaluation should probably be considered.

Our study is not meant to imply that the finding of major arrhythmia without concomitant syncope or dizziness does not warrant antiarrhythmic therapy. And when symptoms occur without serious arrhythmias, important negative information has been obtained and unnecessary therapy avoided. Nor, do our data imply that ambulatory monitoring has no role in the evaluation of patients with symptoms of dizziness and syncope. Dizziness is often a nebulous symptom and is a sensation that is experienced by most individuals at one time or another. Symptoms in the same individual may be related to factors such as the patient's position, blood pressure, blood volume, etc. Thus, the same arrhythmia may not always cause the same symptoms. Nonetheless, in this group of patients, the symptom was significant enough and the cause vague enough to result in physician referral for ambulatory monitoring. Of course, a definite conclusion as to whether or not symptoms are due to cardiac dysrhythmia can only be drawn when the dysrhythmia is recorded at the time of symptomatology. But, when arrhythmias are discovered at any time in patients with these symptoms, an inference is frequently made that such rhythm disorders are precursors to more significant arrhythmias that can cause symptoms. Unfortunately, it is difficult to ascertain which arrhythmias should be considered as such potential precursors, and therefore, we classified arrhythmias as significant in accordance with other reports to allow for easy comparison. Further division into what constitutes a "significant" arrhythmia was also evaluated, but statistical analysis failed to demonstrate any correlation between the presence of symptoms and the presence or absence of any grade of arrhythmia occurring during ambulatory monitoring. Thus, this study focuses on the uncertainties regarding the role of ambulatory monitoring in patients with symptoms of dizziness and syncope, but does not provide any guidelines for future action or for the meaning of a negative ambulatory recording. Long-term prospective studies are necessary in order to answer these questions and are presently in progress in our laboratory.

REFERENCES

9 Hinkle LE, Carver ST, Stevens M: The frequency of asymptomatic disturbances of cardiac rhythm and conduction in middle-aged men. Am J Cardiol 1969; 24:629-650
12 Glasser SP, Clark PI, Applebaum HJ: Occurrence of frequent complex arrhythmias detected by ambulatory monitoring; findings in an apparently healthy asymptomatic elderly population. Chest 1978; 75:565-568

ARRHYTHMIAS DETECTED BY AMBULATORY MONITORING 725