Value of Routine Holter Monitoring for the Detection of Paroxysmal Atrial Fibrillation in Patients With Cerebral Ischemic Events

B.A. Schaer, MD; M.J. Zellweger, MD; T.A. Cron, MD; C.A. Kaiser, MD; S. Osswald, MD

Background and Purpose—Holter monitoring for the detection of paroxysmal atrial fibrillation (PAF) is a routine procedure after cerebral ischemic events, although its value is unknown. The aim of this study was to evaluate the incidence of PAF and its impact on drug treatment modifications in this population.

Methods—Retrospective evaluation of all Holter ECGs in patients with cerebral ischemic events was done. Chart analysis with regard to drug treatment modification and cardiovascular drug therapy was performed in all patients.

Results—Between January 2000 and December 2002, 425 hospitalized patients (median age, 68 years) had routine Holter ECG after a cerebral ischemic event. PAF was diagnosed in 9 patients (2.1%): in 2, oral anticoagulation was contraindicated; 1 had severe carotid stenosis as an additional risk factor; 1 had PAF but was on oral anticoagulation for basilar thrombosis; 2 had had PAF before and were on aspirin; and 3 had a new diagnosis of PAF. The last 5 patients were put on oral anticoagulation. Thus, routine Holter ECG resulted in drug treatment modification in only 5 of 425 patients (1.2%).

Conclusions—PAF in cerebral ischemic event patients has a low incidence and, if diagnosed, rarely leads to drug modification. Therefore, routine Holter monitoring for PAF screening is not recommended in this patient population. (Stroke. 2004;35:e68-e70.)

Key Words: electrocardiography, ambulatory ■ paroxysmal atrial fibrillation ■ risk assessment ■ stroke

Stroke and transient ischemic attacks are among the most frequent causes of hospital admissions and account for tremendous healthcare costs. The stroke rate in the United States is estimated to reach 700,000 cases per year, leading to estimated costs of $50 billion per year. The recurrence rate is as high as 30%, mostly in the first year, and mortality for recurrent stroke is higher. Therefore, huge efforts are undertaken to prevent them. Recommendations for clinical risk stratification include CT scan, MRI scan, carotid duplex scan, echocardiography, and 12-lead ECG. Holter ECG for the detection of paroxysmal atrial fibrillation (PAF) as a possible cause of cardioembolic stroke is often used although not included in these recommendations. However, there are limited data on the incidence of PAF, and data regarding the consequences of PAF diagnosis (eg, drug treatment modifications [DTMs]) are missing.

The aim of the present study was therefore to evaluate the incidence of PAF in stroke patients as diagnosed by a single 24-hour Holter ECG and its impact on subsequent patient management regarding DTM.

Materials and Methods

Patient Population
All hospitalized patients with cerebral ischemic events (CIEs; complete strokes or transient ischemic attacks) who had Holter ECG for risk stratification were included in this retrospective study (observation time, January 2000 to December 2002). The overall rate of CIE patients in this period was supposedly higher (although not known) because patients with permanent AF or severe carotid stenosis as obvious reasons for CIEs were probably not referred. Cardiovascular drug therapy was taken from referral notes or medical charts. If any AF was diagnosed, detailed analysis of medical charts (eg, regarding modifications of anticoagulation and 12-lead ECGs) was done.

Holter ECGs were performed on a SCHILLER MT-200 system (Schiller AG) and independently analyzed by 2 cardiologists. Monitoring time was 24 hours.

Definitions
According to current guidelines, PAF is defined as a self-terminating sequence of >30 seconds of irregular RR intervals and the presence of fibrillatory P waves. Persistent AF is defined as non-self-terminating AF that can be converted to sinus by either drugs or direct current shock. Permanent AF is defined as AF in which conversion to sinus failed or was not attempted. Atrial bursts were defined as irregular beats with fibrillatory waves lasting <30 seconds.
TABLE 1. Anticoagulation and Cardiovascular Drug Therapy of the Patients (n=425)

<table>
<thead>
<tr>
<th>Drugs</th>
<th>n</th>
<th>% of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin/clopidogrel</td>
<td>280</td>
<td>65.9</td>
</tr>
<tr>
<td>OAC</td>
<td>35</td>
<td>8.2</td>
</tr>
<tr>
<td>Heparin</td>
<td>23</td>
<td>5.4</td>
</tr>
<tr>
<td>No anticoagulation therapy</td>
<td>67</td>
<td>15.8</td>
</tr>
<tr>
<td>Missing data</td>
<td>20</td>
<td>4.7</td>
</tr>
<tr>
<td>No cardiovascular drug therapy</td>
<td>257</td>
<td>60.5</td>
</tr>
<tr>
<td>Missing data</td>
<td>20</td>
<td>4.7</td>
</tr>
<tr>
<td>Cardiovascular drug therapy</td>
<td>148</td>
<td>34.8</td>
</tr>
<tr>
<td>ACE inhibitors</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Beta blockers</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Diuretics</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Ca antagonists</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Amiodarone</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

OAC indicates oral anticoagulation.

seconds. Regular supraventricular bursts (suggestive of AV nodal reentrant or ectopic atrial tachycardias) were not qualified as PAF. DT M was defined as initiation of oral anticoagulation (OAC) with Coumadin derivates or switch from aspirin/clopidogrel to OAC.

Statistical Analysis
Comparisons between groups were performed by use of 1-way analysis of variance for continuous variables that are described as mean±SD. A value of P<0.05 was considered statistically significant. Statistical analysis was done with StatView software, version 5 (SAS).

Results
During the study period, 425 Holter ECGs were performed in hospitalized patients with acute CIEs (18.2% of all Holter ECGs in this period at our institution). Of these, 61% were male, and mean±SD age was 67.4±11.8 years. Drug therapy (anticoagulation and cardiovascular drugs) is summarized in Table 1. In 318 patients (74.9%), Holter ECG was normal, either completely normal or with atrial bursts of <5 consecutive beats. Seventy-four (17.4%) had bursts of 5 to 20 beats, and another 12 (2.8%) had bursts of up to 20 seconds that, by the definition used, is not PAF. Twenty-one patients (4.9%) had AF. In 12, AF was persistent or permanent and either already known from patient history (n=5) or clearly visible in a 12-lead ECG performed before Holter ECG (n=7).

In 9 patients (2.1%), PAF was newly diagnosed. Their characteristics are shown in Table 2. Five patients had episodes terminating during Holter ECG, 2 had no AF in all available 12-lead ECGs but AF during the complete Holter ECG, and 2 had AF beginning during and lasting until the end of the Holter ECG. Patients with PAF were older (72.6±9.4 years) compared with non-PAF patients (67.3±12.0, P=NS), and no PAF patient was <55 years of age. No patient had atrial flutter.

Results of Holter ECG led to DTM in 5 patients (1.2%). OAC was started in 3 patients (patients 4, 6, and 8), and 2 (patients 2 and 9) were switched from aspirin to OAC. OAC could not be discontinued in any of the 22 patients on OAC at the time of Holter ECG because of negative Holter ECG (other reasons for OAC such as mechanical heart valves and recurrent deep vein thrombosis).

The number of Holter ECGs performed for a diagnosis of PAF was 47. For one DTM, 85 Holter ECGs were performed.

With Holter ECG costs of $200, overall costs were $85 000, $9400 for the diagnosis of a case of PAF, and $17 000 for 1 DTM.

Discussion
The incidence of permanent AF increases with age. Aronow et al reported an incidence of AF of 5%, 14%, and 22% in patients 60 to 70, 70 to 90, and >90 years of age, respectively. In stroke patients, permanent AF has also been recognized as an independent risk factor for a first-ever stroke,13 worse functional outcome during follow-up,13 and elevated mortality and morbidity.14 In the study by Aronow et al, the incidence of a first-ever stroke over a period of 3 years was 46% in patients with permanent AF compared with 17% in patients with sinus rhythm.

Although the prognostic impact of PAF is not known, Holter ECG has become a routine procedure in the evaluation of CIE patients. Because cost-effectiveness has become a major issue, it is important to question the impact of such routine procedures. Unfortunately, evidence regarding the value of Holter ECG in this setting is limited. Studies investigating the incidence of PAF in stroke patients were published between 1982 and 19969 and included 150 patients at the most. PAF incidence was between 3.3% and

<table>
<thead>
<tr>
<th>Age</th>
<th>Duration of PAF</th>
<th>Modification of Drug Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>1×2 hours, 1×7 hours</td>
<td>PAF in patient’s history, OAC refused, was on aspirin</td>
</tr>
<tr>
<td>66</td>
<td>19 hours</td>
<td>Cardioversion for AF 8 months ago, was on aspirin</td>
</tr>
<tr>
<td>83</td>
<td>2×90’</td>
<td>PAF in patient’s history, OAC contraindicated</td>
</tr>
<tr>
<td>70</td>
<td>12 hours</td>
<td>Received OAC due to PAF-diagnosis</td>
</tr>
<tr>
<td>81</td>
<td>1×3’, 1×20’, 1×90’</td>
<td>PAF and severe carotid stenosis on side of stroke</td>
</tr>
<tr>
<td>84</td>
<td>Multiple episodes</td>
<td>Received OAC due to PAF diagnosis</td>
</tr>
<tr>
<td>69</td>
<td>3×3’</td>
<td>PAF, already on OAC for basilar thrombosis</td>
</tr>
<tr>
<td>69</td>
<td>23 hours</td>
<td>Received OAC due to PAF diagnosis</td>
</tr>
<tr>
<td>77</td>
<td>23 hours</td>
<td>PAF in patient’s history, was on aspirin</td>
</tr>
</tbody>
</table>

PAF indicates paroxysmal atrial fibrillation; AF, atrial fibrillation; OAC, oral anticoagulation.
24.4%. Summing up all those patients, the incidence was 7.6% (62 of 817). Moreover, in 2 studies including 250 patients, PAF was known by history or 12-lead ECG in 14 of 15 PAF patients. Unfortunately, only one study mentioned a definition of PAF (“lasting longer than 5 minutes”). In all these studies, the rate of DTM as a consequence of the Holter ECG results was not evaluated.

In our study with a concise definition of PAF, the incidence of true PAF (no AF in any available 12-lead ECG) was only 2.1%. Because 2 patients had contraindications for anticoagulation, 1 was on anticoagulation for an coincidental basilar thrombosis and 1 had severe carotid artery stenosis (that was probably the cause of the stroke and later operated on), only 5 patients (1.2%) had DTM as a consequence of all 425 Holter ECGs performed.

Because there is no clear evidence for how to treat PAF with regard to anticoagulation (eg, current guidelines of the European Society of Cardiology do not mention PAF), it must be questioned whether results do or should influence clinical management of patients at all.

It might well be that the incidence of PAF is underestimated with Holter ECG and that a prolonged or automated monitoring would provide a higher yield regarding PAF incidence. Recently, promising results were shown with a computer-derived analysis of heart rate intervals, but few patients were studied, and the setting was not that of CIE patients.

Study Limitations
One bias could be that CIE patients with obvious risk factors for stroke (eg, severe carotid stenosis or artificial heart valves with poor OAC) were not referred for Holter ECG. This could have influenced the detected rate of PAF in both ways but not the rate of DTM. Another limitation might be that with a monitoring period >24 hours, more episodes of PAF would have been detected, but so far, 24-hour monitoring is recognized as the standard period.

Conclusions
Our study showed that routine Holter ECG has little value for the clinical management in stroke patients because the incidence of PAF is low and the impact of its diagnosis on the antithrombotic therapy is uncertain. Furthermore, data on the long-term effect of anticoagulation in these patients and clear-cut guidelines are missing. Therefore, we do not recommend Holter ECG as a routine procedure after CIEs.

References
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