Treatment of Underlying Atrial Fibrillation: Paced Rhythm Obscures Recognition
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OBJECTIVES The purpose of this study was to evaluate the rate of recognition of atrial fibrillation (AF), use of warfarin and prevalence of cerebrovascular accident (CVA) in paced versus unpaced patients during admission to a tertiary care teaching hospital.

BACKGROUND The presence of AF underlying a continuously paced rhythm may be under recognized and result in a lower rate of anticoagulation and higher incidence of CVA.

METHODS The identification of AF on 12 lead electrocardiogram (ECG) and telemetry, “optimal use” of anticoagulants that is, warfarin or aspirin, when warfarin is contraindicated and history of prior CVA was studied in three groups: 1) group A with continuously paced rhythm on ECG and telemetry (n = 30), 2) group B with intermittently paced rhythm on ECG and telemetry (n = 59), and 3) group C with persistent AF and no permanent pacemaker (n = 50).

RESULTS The identification and documentation of AF was significantly lower in the continuously paced group A (20%) versus the intermittently paced group B (44%). Both groups A and B were substantially lower than unpaced controls. “Optimal use” of anticoagulants was significantly lower in group A (40%) compared with groups B (78%) and C (72%) but was not different between groups B and C. The prevalence of prior CVA was not significantly different between the three groups.

CONCLUSIONS All ECGs in patients with paced rhythm should be examined closely for underlying AF to prevent under-recognition and under-treatment with anticoagulants. (J Am Coll Cardiol 2000;36:784–7) © 2000 by the American College of Cardiology

The role of anticoagulation to prevent thromboembolic events in patients with nonrheumatic atrial fibrillation (AF) is well established (1–9). Pacemaker recipients are by and large an elderly population with underlying heart disease and a high prevalence of AF (10). The diagnosis of AF is often based on the recognition of an irregularly irregular rhythm. We hypothesized that the absence of an irregular rhythm in paced patients may result in a decreased recognition of underlying AF, a lower rate of anticoagulation and a higher incidence of cerebrovascular accident (CVA).

METHODS

Study protocol. We reviewed all electrocardiograms (ECGs) performed on patients admitted to a tertiary care teaching hospital during a one-year period from January 1998 to December 1998. All ECGs were recorded on a Hewlett Packard 1700A and interpreted by one of 16 board-certified cardiologists. Electrocardiograms with the primary diagnosis of paced rhythm (n = 305) were examined for electrocardiographic evidence of underlying AF and documentation of AF in the physician interpretation. Electrocardiograms in patients with the primary diagnosis of AF and without a permanent pacemaker were used as controls.

Three board-certified electrophysiologists independently reviewed the ECGs. The diagnosis of AF underlying a paced rhythm was defined as the presence of irregularly irregular RR intervals with fibrillatory waves during pacer inhibition or the presence of clear fibrillatory waves and no discernible P waves between pacemaker spikes on 12 lead ECG. One hundred eighty-eight of 305 ECGs exhibited underlying P waves and were excluded from analysis. There was unanimous agreement among the reviewers on the diagnosis of AF in 105 of the remaining 117 ECGs (90%) (Fig. 1). One hundred eighty-eight of 305 ECGs exhibited underlying P waves and were excluded from analysis. There was unanimous agreement among the reviewers on the diagnosis of AF in 105 of the remaining 117 ECGs (90%) (Fig. 1). One hundred three of 105 ECGs reflected single chamber ventricular pacing. Only two cases of dual chamber pacing during AF were identified (Fig. 2). The corresponding patient charts were reviewed for identification of AF, continuous versus intermittent pacing, anticoagulation with warfarin at discharge, contraindication to anticoagulation and “optimal use” of anticoagulants. “Optimal use” was defined as the total number of patients treated with either warfarin or aspirin, when warfarin was contraindicated.

As a consequence of chart review, 16 of 105 patients were excluded from analysis. Five patients were noted to be in sinus rhythm on telemetry or subsequent ECG, three patients had other indications for anticoagulation, six died during the hospitalization from unrelated causes, and two charts were unavailable for review. Analysis was performed on the remaining 89 paced patients. Fifty randomly selected unpaced patients with electrocardiographic diagnosis of AF were used as controls.
The 139 patients were then divided into three groups: 1) group A, 30 patients with continuously paced rhythm on ECG and telemetry and underlying AF, 2) group B, 59 patients with intermittently paced rhythm on ECG or telemetry and underlying AF, 3) Group C, 50 patients with persistent AF without an implanted permanent pacemaker. Patient characteristics (Table 1). Patient charts were reviewed to document age, gender, history of hypertension, diabetes mellitus, presence of organic heart disease (OHD) and history of CVA/transient ischemic attack. The mean age of the entire group was 79 ± 9 years with 56 women and 83 men. Seventy-seven patients had a history of hypertension, 22 had a history of diabetes mellitus, 114 had a history of OHD, and 32 had a history of prior CVA. All patients had one or more of the following: age > 65 years, hypertension, diabetes mellitus, previous CVA/transient ischemic attack and congestive heart failure, which placed them at high risk for thromboembolic phenomena (6,11).

Statistical analysis. Statistical analysis between the three groups was done using a generalized linear model with the group as the independent variable and age as the dependent variable. The categorical variables were examined using a Pearson chi-square when possible and a Fisher exact test otherwise. Results are reported as mean ± standard deviation. A p value less than 0.05 was considered statistically significant.

RESULTS

Patient characteristics. The mean age of patients was 81 ± 8 years in group B, 83 ± 9 years in group A and 75 ± 9 years in group C. There were no significant differences in the gender distribution, incidence of diabetes mellitus, prior CVA or OHD among the three groups. The mean age was higher in groups A and B compared with group C (p < 0.001) and the incidence of hypertension lower in group A versus group C (p < 0.01).

Identification of AF. Atrial fibrillation was identified and documented within the chart in 6 of 30 patients (20%) in group A compared with 26 of 59 patients (44%) in group B and, by definition, all 50 patients in group C. There was a significant under-recognition of AF in the continuously paced group (A) when compared with the intermittently paced group (B) (p < 0.05) or un paced controls, group (C).

Anticoagulation at discharge. At discharge, 10 of 30 patients (33%) in group A were anticoagulated with warfarin as opposed to 40 of 59 patients (68%) in group B and 27 of 50 patients (54%) in group C. There was a significant difference between groups A and B and groups A and C;

<table>
<thead>
<tr>
<th>Table 1. Patient Demographics</th>
<th>Group A (n = 30)</th>
<th>Group B (n = 59)</th>
<th>Group C (n = 50)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: mean ± SD</td>
<td>83 ± 9</td>
<td>81 ± 8</td>
<td>75 ± 9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female gender</td>
<td>13 (43%)</td>
<td>25 (42%)</td>
<td>18 (36%)</td>
<td>NS</td>
</tr>
<tr>
<td>History of hypertension</td>
<td>12 (40%)</td>
<td>31 (53%)</td>
<td>34 (68%)</td>
<td>0.043</td>
</tr>
<tr>
<td>History of diabetes mellitus</td>
<td>2 (7%)</td>
<td>12 (20%)</td>
<td>8 (16%)</td>
<td>NS</td>
</tr>
<tr>
<td>History of CVA</td>
<td>8 (27%)</td>
<td>9 (15%)</td>
<td>15 (30%)</td>
<td>NS</td>
</tr>
<tr>
<td>History of OHD</td>
<td>27 (90%)</td>
<td>51 (86%)</td>
<td>36 (72%)</td>
<td>NS</td>
</tr>
</tbody>
</table>

CVA = cerebrovascular accident; OHD = organic heart disease; SD = standard deviation.
p \leq 0.01. Contraindications to warfarin were present in 11 of 30 patients (37%) in group A, 11 of 59 patients (19%) in group B and 13 of 50 patients (26%) in group C and were not significantly different among the three groups. In patients with contraindication to warfarin, aspirin was prescribed in 2 of 11 patients (18%) in group A, 6 of 11 patients (55%) in group B and 9 of 13 patients (69%) in group C. The rate of treatment with aspirin was less frequent in group A compared with group C (p < 0.01); however, rate of treatment was not different between groups A and B or between groups B and C. “Optimal use” of anticoagulants, that is, warfarin or aspirin, when warfarin was contraindicated was noted in 12 of 30 patients (40%) in group A, in 46 of 59 patients (78%) in group B and 36 of 50 patients (72%) in group C. There was a significant difference between groups A and B (p < 0.001) and groups A and C (p < 0.01; Fig. 2).

DISCUSSION

Identification of AF on ECG. In this analysis of paced and unpaced patients with AF, we found a statistically lower incidence of identification of AF in the continuously paced group (A) versus the intermittent and unpaced groups in spite of ECG overreading by experienced board-certified cardiologists. Failure to identify AF may have been due to a lack of irregularity of the paced rhythm, inability to make the diagnosis based on presence of fibrillatory waves or absence of P waves alone or the inappropriate conclusion by the reader that the underlying rhythm did not require documentation. In any case the lower rate of identification of AF parallels the lower rate of anticoagulation and suggests an excess risk of CVA.

Anticoagulation at discharge. Several large randomized trials in patients with nonrheumatic AF have demonstrated a 37% to 86% risk reduction for CVA in groups treated with oral anticoagulation compared with placebo (1–8). In our study a higher prevalence of prior CVA was not observed; however, the sample size was small, the follow-up period short, a prospective analysis for CVA was not performed, nor was there any attempt to quantitatively assess prior risk exposure (e.g., years unprotected AF) between patient groups. Cerebrovascular accident was evaluated solely by history, an admittedly crude index. Prior studies attesting to the benefit of anticoagulation in nonrheumatic AF support the contention that our study group is at increased risk of CVA and mitigates against the role of another prospective trial for this subgroup.

The use of warfarin in patients with AF has been reported to be 40% to 64% of hospitalized patients without contraindication to anticoagulation (12–16). In this report, 54% of unpaced patients received warfarin although >72% were “optimally” treated when both warfarin and aspirin were considered.

Two previous studies address the incidence of anticoagulation in paced patients with underlying AF. Sparks et al. (17) in a study of 53 high-risk patients with AF and permanent pacemakers being followed in an outpatient pacemaker clinic reported that only 8 of 53 patients (15%) were anticoagulated with warfarin. In an earlier report by Langenfeld et al. (18), warfarin was used in only 1 of 63 patients (2%) with permanent pacemakers and AF. This study was published before the randomized trials (1–9) reporting the benefits of warfarin, which may partially explain the findings. We report a higher incidence of warfarin use (56%) in our paced population and “optimal” treatment with warfarin or aspirin in 65%. The subgroup of continuously paced patients had the lowest anticoagulation rate (33%) and rate of “optimal” treatment (40%) and clearly represents a risk exposed subset.

Study limitations. There are several limitations of this study. It was not possible to clarify whether the low rate of identification and documentation of AF, our primary end point, occurred due a diagnostic problem or a judgement error. If physicians do not recognize the need to anticoagulate paced patients with underlying AF, identification of the dysrhythmia will not improve their management.

The link between failure to document AF and the failure to anticoagulate is implied but not proven. Other factors may have been responsible for the low rate of anticoagulation, and our assessment of anticoagulation may overestimate the problem somewhat. For the purpose of this study, we defined “optimal” use of anticoagulation as treatment with warfarin or aspirin when a contraindication to warfarin was documented. Our definition of “optimal use” of anticoagulants may slightly underestimate a true ideal since some patients with contraindication to warfarin also have contraindications to aspirin, and some patients may have had contraindications that were undocumented or missed in our survey.

Finally, the failure to note an increased prevalence of prior CVA in our paced patients was somewhat of a surprise; however, the groups were small, there was no prospective follow-up nor was there any attempt to quantitatively assess prior risk exposure (e.g., years unprotected AF) between patient groups. Nevertheless, we believe the link between AF and CVA is well established and that paced patients are at equal or greater risk than their unpaced counterparts.

Clinical implications. The identification of AF in patients with predominantly paced rhythm on 12 lead ECG is often overlooked. We suspect this is due to the absence of an irregular rhythm. Failure to recognize AF on ECG in patients with continuous pacing suggests under-recognition may have made a significant contribution to undertreatment. Regardless of the reason, that is, failure to recognize or failure to treat, the incidence of anticoagulation at discharge was significantly lower in the continuously paced group compared with the intermittent or unpaced groups. Although this study did not show an increased prevalence of prior CVA in the continuously paced subgroup, there is every reason to anticipate an eventual excess.
incidence of thromboembolic events in this group. We recommend that all ECGs interpreted as paced rhythms be examined closely for evidence of underlying AF with particular attention to continuously paced rhythms. Atrial fibrillation, if discovered, must be documented and patients treated according to currently accepted guidelines for anticoagulation (19).

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REFERENCES