Incidence and predictors of atrial fibrillation and its impact on long-term survival in patients with supraventricular arrhythmias

Cevher Ozcan1,2, Jordan B. Strom1, John B. Newell1, Moussa C. Mansour1, and Jeremy N. Ruskin1*

1Cardiac Arrhythmia Service, Institute for Heart, Stroke and Vascular Care, Massachusetts General Hospital, Boston, MA, USA; and 2Division of Cardiovascular Medicine, University at Buffalo School of Medicine and Biomedical Sciences, NY, USA

Received 17 January 2014; accepted after revision 24 April 2014; online publish-ahead-of-print 6 June 2014

Aims
To determine the incidence and predictors of atrial fibrillation (AF) and its impact on survival in patients with other forms of supraventricular arrhythmias (SVAs) including atrial flutter (AFL), atrial tachycardia (AT), atrioventricular reentrant (AVRT), and AV nodal reentrant tachycardia (AVNRT). We hypothesized that SVA may increase risk of AF and concomitant AF may influence long-term survival.

Methods and results
All patients who underwent catheter ablation for SVA from 2000 to 2010 were included in this study. The patients were identified retrospectively and the vital status determined prospectively. Observed survival in the study cohort was compared with survival rates in the age- and sex-matched general population. The study group included 1573 patients (mean age 50.5 ± 18 years, 47% female) with AVNRT (38.5%), AFL (29.6%), AVRT (22.6%) and AT (9.3%). The patients were followed for a mean of 35 months (median 23 months). Atrial fibrillation was documented in 424 patients (27%) with a higher incidence in males (35 vs. 18%). Atrial fibrillation was present in 19.6% of patients before the ablation and developed in 9.07% after ablation. Atrial fibrillation commonly occurred in patients with AFL (57.5%), AT (27.4%), AVRT (13.5%), and AVNRT (9.7%). Older age, prolonged PR interval, dilated left atrium, low left ventricular ejection fraction and presence of AFL were independent predictors for concomitant AF. Long-term survival was worse in the presence of AF.

Conclusion
The incidence of AF is high in patients with other forms of SVA. The most common association is between AFL and AF. Long-term survival is decreased in those who have concomitant AF, although AF did not emerge as an independent predictor of mortality when adjusted for other covariates.

Keywords
Atrial fibrillation • Supraventricular tachycardia • Ablation • Survival • Predictors

Introduction
Supraventricular arrhythmias (SVAs) including atrial fibrillation (AF), atrial flutter (AFL), atrial tachycardia (AT), atrioventricular reentrant (AVRT), and AV nodal reentrant (AVNRT) tachycardias are commonly encountered in clinical practice.1,2 In particular, AF is the most common sustained arrhythmia, affecting ~1% of the general US population and 8% of octogenarians.1–6 Atrial fibrillation is associated with increased risk of all-cause mortality and morbidity including stroke, heart failure, dementia, embolic events, hospitalization, and impaired quality of life.5,6–11 Early diagnosis and management of AF is important to prevent morbidity and mortality. With the exception of AFL, patients with other forms of SVA are not considered to be at high risk for development of AF in clinical practice. Therefore, prospective surveillance is not initiated for early diagnosis of AF in this population. Although the coexistence of more than one type of SVA, particularly AF and AFL, has been reported, the prevalence and mechanisms of this phenomenon are not clear.12–17

The pathogenesis of AF is complex and is influenced by both structural and electrical factors.18–20 Both electrical and structural atrial remodelling may facilitate the initiation and persistence of AF. This could have occurred in patients with other forms of SVA. Thus, we hypothesized that the presence of any type of SVA may be associated with an increased risk for the development of AF and, if
What’s new?

- Atrial fibrillation (AF) occurs commonly in patients with other forms of supraventricular tachyarrhythmias (SVA).
- While AF is seen most commonly in association with atrial flutter (57%), concomitant AF also occurs in patients with atrial tachycardia (27%), atrioventricular reentrant tachycardia (14%) and atrioventricular nodal reentrant tachycardia (10%).
- Older age, prolonged PR interval, dilated left atrium, left ventricular systolic dysfunction and the presence of atrial flutter are independent predictors for concomitant AF.
- Comorbidities are more prevalent among patients with SVA and concomitant AF, and patients with SVA and AF have a higher mortality rate than those without AF.
- Treatment of SVA with catheter ablation is associated with a lower rate of clinically apparent AF than that seen prior to ablation.

Follow-up

The follow-up period for the patients who underwent catheter ablation for SVA began at the time of the procedure and ended in December 2010 or at the time of death. Vital status of all 1573 patients in the study group was determined from the national death index by January 2011 regardless of their last date of clinical follow-up. Patients who underwent ablation had post-procedure follow-up visits in the clinic at 4–6 weeks and periodically thereafter. The diagnosis of AF was based on documentation by electrocardiogram or Holter monitor recording during clinical follow-up by an electrophysiologist. Causes of death were determined by a review of hospital records and death certificates. All patients who entered the study had at least one follow-up visit. A majority of the patients (75%) had more than one follow-up visit at our institution.

Statistical analysis

The incidence of AF was determined by clinical documentation of AF before the procedure and during post-procedure follow-up. Atrial fibrillation that developed with catheter manipulation or programmed

Methods

Study population

All patients with AFL, AVNRT, AVRT, and AT who underwent EPS and catheter ablation at the Massachusetts General Hospital between June 2000 and March 2010 were included in the study. The study was approved by the hospital’s Institutional Review Committee. All patients under study had symptomatic SVA that met standard indications for diagnostic EPS and catheter ablation with radiofrequency or cryothermal energy. Ablation was performed using standard techniques.

Reference group

For the survival analysis, a reference group was constructed from age- and sex-matched cohort mortality rates in the general US population. The expected survival rate was calculated on the basis of age and sex-specific mortality rates in the general US population. The predictors for the development of AF and survival were determined.

Data collection

Data were abstracted from a centralized electronic medical record containing complete records of all patients treated and followed at the Massachusetts General Hospital during the range of study dates. These records provide detailed histories and diagnoses for all inpatient and outpatient encounters, including emergency room visits, death certificates, and autopsy reports.

Figure I Clinical characteristics of the study population. Distributions of SVAs and gender in the study cohort and the patients with AF are presented (A). The study cohort included patients with AFL, AT, AVRT, and AVNRT tachycardias (left panel). Atrial fibrillation was documented in 27% of the study cohort with SVA (right panel). The prevalence of AF was high in patients with other forms of SVA (B).
stimulation in the course of the procedure was not included in the analysis of AF incidence. Survival of the patients who underwent ablation was estimated by the Kaplan–Meier method. For each person who underwent ablation, the expected survival was calculated on the basis of age- and sex-specific mortality rates in the US population. The observed and expected survival rates were compared by means of the one-sample log-rank test. Univariate and multivariate associations between baseline variables and survival were assessed by means of the log-rank test and a Cox regression model. The following variables were considered as potential predictors of the development of AF: demographic factors (age and sex), presence of heart disease (ischaemic heart disease, cardiomyopathy, valvular heart disease, enlarged left atrium, conduction intervals, and left ventricular dysfunction), and associated clinical conditions (diabetes mellitus, hypertension, and abnormal renal function). Multivariate models are presented in the form of point estimates of the hazard ratios, with 95% confidence intervals (CIs). Additional comparisons between groups were performed by Student’s t-test. A value of \( P < 0.05 \) was considered statistically significant.

### Results

#### Patient characteristics

A total of 1573 patients (740 women and 833 men) who underwent EPS and catheter ablation for SVA were studied. The study group consisted of patients with AVNRT \( (n = 606, 38.5\%) \), AFL \( (n = 466, 29.6\%) \), AVRT \( (n = 355, 22.6\%) \), and AT \( (n = 146, 9.3\%) \) (Figure 1A, left panel). The baseline characteristics of the patients who underwent ablation are summarized in Table 1.

### Table 1 Baseline characteristics of the study population

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>All patients ( (n = 1573) )</th>
<th>Patients with AF ( (n = 424) )</th>
<th>Patients without AF ( (n = 1149) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (female/male)</td>
<td>740/833</td>
<td>131/293</td>
<td>609/540</td>
</tr>
<tr>
<td>Age at the time of ablation, year</td>
<td>50.5 ± 18</td>
<td>58.8 ± 15</td>
<td>47 ± 18</td>
</tr>
<tr>
<td>Duration of follow-up, month</td>
<td>34.8 ± 36</td>
<td>41.4 ± 37</td>
<td>32 ± 36</td>
</tr>
<tr>
<td>AVNRT, n</td>
<td>606</td>
<td>62</td>
<td>544</td>
</tr>
<tr>
<td>AFL, n</td>
<td>355</td>
<td>48</td>
<td>307</td>
</tr>
<tr>
<td>AT, n</td>
<td>466</td>
<td>274</td>
<td>192</td>
</tr>
<tr>
<td>LVEF, %</td>
<td>60 ± 12</td>
<td>56 ± 15</td>
<td>61 ± 10</td>
</tr>
<tr>
<td>Left atrium &gt; 40 mm, %</td>
<td>22</td>
<td>40</td>
<td>16</td>
</tr>
<tr>
<td>PR interval &gt; 200 msec, %</td>
<td>8</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>QRS duration &gt; 120 msec, %</td>
<td>12</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>QTc interval &gt; 450 msec, %</td>
<td>23</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Coronary artery disease, %</td>
<td>13</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>Heart failure, %</td>
<td>11</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>30</td>
<td>40</td>
<td>26</td>
</tr>
<tr>
<td>Valvular heart disease, %</td>
<td>17</td>
<td>27</td>
<td>13</td>
</tr>
<tr>
<td>Coronary artery bypass graft surgery, %</td>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Dyslipidaemia, %</td>
<td>29</td>
<td>39</td>
<td>25</td>
</tr>
<tr>
<td>Diabetes, %</td>
<td>10</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Elevated creatinine, %</td>
<td>6</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Thyroid disease, %</td>
<td>8</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

AF, atrial fibrillation; AVNRT, atrioventricular nodal reentrant tachycardia; AVRT, atrioventricular reentrant tachycardia; AFL, atrial flutter; AT, atrial tachycardia.

### Table 2 Multivariate predictors of AF in patients with supraventricular tachyarrhythmias

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard ratio (95% CI)</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFL</td>
<td>3.42 (2.01–5.82)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Older age</td>
<td>1.02 (1.00–1.03)</td>
<td>0.003</td>
</tr>
<tr>
<td>Normal LVEF</td>
<td>0.98 (0.96–0.99)</td>
<td>0.013</td>
</tr>
<tr>
<td>Enlarged left atrium</td>
<td>1.72 (1.08–2.72)</td>
<td>0.021</td>
</tr>
<tr>
<td>Prolonged PR interval</td>
<td>1.27 (0.96–1.69)</td>
<td>0.092</td>
</tr>
</tbody>
</table>

CI, confidence interval; AFL, atrial flutter.

**Incidence and predictors of atrial fibrillation**

During a median follow-up of 24 months (mean 35 months; range 1 day to 138 months), AF was documented in 424 patients (27%) (Figure 1A, right panel). Of the 424 patients with AF, 309 patients (73%) had AF prior to presenting for catheter ablation and 115 patients (27%) developed AF during follow-up after the procedure. Coexistence of AF and SVA was documented in 19.6% of the study population prior to treatment of SVA with catheter ablation and in 9.0% of the patients after catheter ablation of SVA. The highest prevalence of AF was observed in patients with AFL (274 of 466 patients, 57.5%) (Figure 1B). Atrial fibrillation was also relatively common in patients with AT (27.4%), AVRT (13.5%), and AVNRT (9.7%) (Figure 1B). In subgroup analyses, there was a significant
difference in the occurrence of AF in patients with AFL before and after cavotricuspid isthmus ablation (45.3% before ablation vs. 24.7% after ablation, $P < 0.001$) during a mean follow-up of 39 months (median 28 months) after ablation. Similarly, patients with AT had a higher prevalence of AF before the ablation (24%) compared to post-ablation (4.5%, $P < 0.001$) over a mean follow up of 33 months (median 22 months) following ablation. AVNRT was associated with AF in 5.9% of patients before ablation and 4.4% of patients after catheter ablation ($P = 0.01$) over a mean follow up of 34.5 months (median 22 months). Atrial fibrillation was present in 7.9% of patients with AVRT prior to ablation and in 6.4% of patients after ablation ($P = 0.012$) over a mean follow-up of 32 months (median 14 months).

Multivariate analysis revealed that older age, low left ventricular ejection fraction (LVEF), prolonged PR interval, dilated left atrium, and the presence of AFL were independent predictors of the development of AF (Table 2). The area under the receiver operating characteristic curve was 0.7950 for the best three variables for predicting AF.

**Gender differences**

There was a gender difference in the incidence of AF observed in patients with SVA (Figure 1A). The prevalence of AF was higher in males (35%) compared with females (18%) ($P < 0.001$). In patients with AFL, AF was common in both genders (60% of males and 65% of females) ($P > 0.05$). The prevalence of AF was also similar in male (29%) and female (27%) patients with AT ($P > 0.05$). However, AF was more common in males compared with females with AVNRT (14 vs. 8%, $P = 0.009$) and AVRT (18 vs. 7%, $P < 0.001$).

![Figure 2](image)

**Figure 2** Long-term survival in patients with SVAs. The observed survival in patients with SVAs was worse than that of expected survival of the age- and sex-matched reference population ($P < 0.05$) (A). The survival of patients with SVA who had AF was significantly worse than that of the patients without AF ($P < 0.05$) (B). The observed survival among patients without AF or AFL differed less from the reference population than did the overall SVA cohort (C). However, in the absence of co-morbid conditions including coronary artery disease, valvular heart disease, diabetes, abnormal creatinine, low LVEF and AFL, the observed survival in patients with SVA was comparable with that of the general population ($P > 0.05$) (D).

### Table 3 Multivariate predictors of death in patients with supraventricular tachyarrhythmias

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard ratio (95% CI)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older age</td>
<td>1.05 (1.03–1.07)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Normal LVEF</td>
<td>0.97 (0.96–0.98)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.01 (1.30–3.12)</td>
<td>0.002</td>
</tr>
<tr>
<td>Valvular heart disease</td>
<td>1.87 (1.22–2.86)</td>
<td>0.004</td>
</tr>
<tr>
<td>Abnormal creatinine</td>
<td>1.78 (1.11–2.67)</td>
<td>0.01</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>1.52 (0.96–2.42)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

CI, confidence interval.
Survival analysis

The observed survival in patients with SVA who underwent catheter ablation was significantly worse than the expected survival of the age- and sex-matched cohort from the US population (P < 0.001, Figure 2A). The overall estimated 10-year survival of the study population was 82 ± 2% (95% CI 77–86%), while the expected survival of the age- and sex-matched cohort from the general US population was 94 ± 0.7% (95% CI 92–95%). Independent predictors of reduced survival in the multivariate analysis included older age, coronary artery disease, valvular heart disease, diabetes, abnormal creatinine, and low LVEF (Table 3).

The 10-year survival of patients with SVA and associated AF was significantly lower than that of patients with SVA and no AF (76 ± 3.6 CI 68, 83% vs. 84 ± 2.8 CI 77, 89%; P < 0.001) (Figure 2B). However, the observed survival in the overall cohort of patients with SVA (with or without AF) was also worse than the expected survival in the age- and sex-matched cohort (P < 0.001). A significant difference between the observed survival in patients with SVA without AF and the expected survival in the age-and sex-matched general US population was also observed in this study (Figure 2B, P < 0.001). The 10-year survival in patients with no AF and no AFL was 89% vs. 97% for the reference group. Thus, the observed survival among patients without AF or AFL differed less from the reference population than did the overall SVA cohort (Figure 2C). Patients with AFL showed a relatively higher mortality (14%) compared with those with other forms of SVA (AVNRT, AVRT, and AT). Also, AFL is significantly correlated (r = 0.46) with AF. Moreover, the observed survival in younger patients (<50 years old) without known risk factors including coronary artery disease, valvular heart disease, diabetes, abnormal creatinine, low LVEF, and AFL was comparable with that of the reference population (Figure 2D, P > 0.05). Thus, the survival of patients with SVA was decreased in those with AF, AFL, or comorbidities.

Mortality evaluation

At the latest assessment, 109 of 1573 patients (6.9%) had died during a mean follow-up of 39 ± 29 months (range, 8 days to 106 months). The incidence of death was higher in males (8.5%, 71 of 833) than in females (5.2%, 38 of 730) (P = 0.005). Atrial fibrillation was present in 41% of males and 47% of females who died. The subset of patients who died comprised an older population with a mean age of 68 ± 12 years (range, 30–87 years) at the time of ablation and a high prevalence of underlying cardiac and noncardiac diseases including hypertension (57%), dyslipidaemia (54%), coronary artery disease (48%), valvular heart disease (48%), heart failure (39%), diabetes (28%), abnormal renal function (26%), and prior coronary bypass surgery (23%). The mean LVEF was lower in patients who died (49 ± 17%) than total study group (60 ± 12%). Among the patients who died, the primary SVA was AFL in 60%, AVNRT in 23%, AT in 9%, and AVRT in 8%. A total of 43% of patients who died had documented AF. The highest incidence of death occurred in patients with coexistent AFL and AF. The cause of death was identified in 25 of 109 patients (23%). Of these 25 deaths, 72% were due to non-cardiac causes and 20% were due to congestive heart failure.

Discussion

This study evaluated the prevalence and predictors of AF and the impact of AF on long-term survival in patients with SVA who underwent catheter ablation for the treatment of symptomatic AFL, AT, AVRT, and AVNRT. We found that the presence of any form of SVA was associated with an increased risk for the development of AF. The prevalence of AF is high in patients with SVA. The highest prevalence of coexistent AF was observed in patients with AFL. AF was more common in men than in women with SVA. Atrial fibrillation was documented more often than before catheter ablation. Older age, low LVEF, prolonged PR interval, dilated left atrium, and the presence of AFL were independent predictors for the development of AF in this population.

The existence of two forms of SVA in the same patient as well triggering of AF by AVRT, AVNRT, or AT are well described.12–17 Previous studies have reported the occurrence of AF in 56% of patients with lone AFL over a mean follow-up of 5.5 years and in 50% of patients with typical AFL within 2.5 years after cavotricuspid isthmus ablation.16,17 Our study included the largest cohort of patients with AFL and evaluated the prevalence of AF prior to and after catheter ablation. The findings are consistent with those reports, with a 57.5% prevalence of AF in patients undergoing cavotricuspid isthmus ablation for AFL. In addition, a history of concomitant AF and AFL was reported to be present in 68% of patients with sustained intra-atrial reentrant tachycardia in a single study.22 In our study, AF was documented in 27.4% of patients with AT. During 31 months of follow-up, 19% of 169 patients with paroxysmal AVNRT and AVRT reportedly developed AF.14 In our study, 13.5% of patients with AVRT and 9.7% of patients with AVNRT had concomitant AF.

Previous studies have demonstrated that treatment of AVRT and AVNRT by catheter ablation may prevent the development of AF.23,24 Successful catheter ablation of accessory pathways prevented the recurrence of AF in 91% of 129 symptomatic patients with AVRT.21 In our study, we found that clinically apparent AF was more commonly observed in the patients before vs. after treatment of SVA with catheter ablation. This observation suggests that catheter ablation of SVA may have contributed to a reduction in the incidence of AF post-procedure in this study population.

Conversely, the reported prevalence of SVA in patients with AF is relatively low.24–26 In one study, SVAs were present in 7.6% of patients referred for catheter ablation of AF (typical AFL 3.7%, typical AVNRT 1.7%, AVRT 1.2%, and AT 0.98%).25 Atrial fibrillation recurrence was higher among patients in whom AFL was induced at the EPS (53%) compared with those with inducible AVRT, AVNRT, or AT. In a second study, the prevalence of concomitant AVNRT among patients referred for catheter ablation of AF was 4.3%.24 In the latter study, 12 of 13 patients (92%) who underwent slow-pathway modification for AVNRT without left atrial ablation remained free of AF off antiarrhythmic medications after a single procedure, supporting the role of AVNRT as a trigger of AF.24 In our study population, the prevalence of clinically apparent AF was higher before compared with after catheter ablation, raising the possibility that treatment of SVA with catheter ablation may reduce susceptibility to AF in some patients.

The mechanisms by which AF and other SVA coexist are not well understood. Short cycle lengths have been shown to decrease atrial refractory periods and increase vulnerability to the occurrence of AF.
and AFL. However, age, presence of structural heart disease, accessory pathway location, atrial refractory periods, and accessory pathway anterograde conduction parameters were not found to be predictors of AF in patients with AVRT. Persistence of atrial vulnerability to inducible AF by atrial extrastimuli after catheter ablation was the only factor associated with recurrence of AF in this population.

Changes in the cellular and tissue electrical properties of atrial myocardium including changes in ion channel physiology, shortening of action potential duration and effective refractory periods, and slowing and heterogeneity of intra-atrial conduction may all play a role in the pathogenesis of AF and AFL. While focal triggers such as ectopic activity from the pulmonary veins and other sites are frequently implicated in the initiation of AF, electrical and structural substrate abnormalities within the atrial myocardium may be important for the perpetuation of this arrhythmia. While SVA may induce or exacerbate these substrate abnormalities, thereby increasing susceptibility to AF, it is more likely that some patients may be predisposed to both SVA and AF for structural, genetic, or other as yet undefined reasons.

Survival and predictors

In this study, long-term survival among patients with SVA was worse than that of age- and sex-matched members of the general US population. The survival of patients with SVA following catheter ablation was decreased in those with other risk factors. Independent predictors of shorter survival in the multivariate model included older age, coronary artery disease, valvular heart disease, diabetes, abnormal creatinine, and low LVEF, all of which were more prevalent in the subset of patients with AF than in those without AF. In the absence of comorbidities, the long-term survival among younger patients with SVA who have undergone catheter ablation was similar to the expected survival in the general population. This observation highlights the impact of comorbidities on long-term survival in patients with SVA. The fact that younger patients without comorbidities had a 10-year survival rate comparable with that of the general population. This suggests that catheter ablation or SVA has no negative impact on survival. Our findings are consistent with previously reported observations that preexisting cardiac disease, age, diabetes, and renal dysfunction increase the risk of developing AF and adversely affect the long-term survival in patients with SVA. These findings may be reflective of patients seen at a tertiary referral centre in whom the prevalence of comorbidities and AF is likely to be higher than that of the general population of patients with SVT.

The coexistence of AF with other forms of SVA was a univariate predictor of shorter survival. However, AF did not emerge as an independent predictor of survival in the multivariate analysis. While AF was a univariate predictor of mortality in our patient population, in large epidemiological studies, AF has emerged as an independent predictor of mortality both in the general population and in patients with underlying heart disease. Whether the explanation for this difference is related to the comparatively small sample size and relatively low frequency of AF in this study compared with large population-based studies is uncertain.

This study also demonstrates gender differences in the prevalence of AF and mortality rates in patients with SVA. Men with SVA have a higher incidence of AF and death compared with women. This was likely the result of more frequent comorbidities in men since gender was not an independent predictor of AF or mortality in the multivariate analysis. While coexistence of AFL and AF was common in both groups, women with AVNRT or AVRT have a lower incidence of AF than men. Although the effect of gender on SVA and AF is known, the gender-specific information regarding the incidence of AF in patients with SVA has not been well documented. In patients with SVA undergoing EPS, AVRT was found to be more common in men than in women, whereas AVNRT and AT occurred more often in women.

Limitations

The results of this study should be interpreted in light of the limitations imposed by a retrospective study design. All patients undergoing catheter ablation for SVA were enrolled consecutively and all the data in this analysis were obtained from original hospital records. However, the lack of rigorous prospective surveillance for and detection of AF following ablation likely underestimated the prevalence of this arrhythmia in the study population. In addition, this study was not designed to evaluate cause-specific mortality in patients with SVA. Finally, the results of this study may not be applicable to the broader population of patients in the community with the fewer comorbidities since the prevalence of comorbidities was higher in our study cohort as a result of referral bias to a tertiary centre.

Conclusions

The prevalence of AF in patients with other forms of SVA is high, particularly in men. The predictors of AF in patients with SVA include the presence of AFL, older age, enlarged left atrium, prolonged PR interval, and left ventricular dysfunction. Treatment of SVA with catheter ablation may reduce the risk of subsequent AF. Patients with SVA and AF have a higher mortality rate than those without AF, although AF did not emerge as an independent predictor of mortality in this study. Comorbidities, such as coronary or valvular heart disease, diabetes, abnormal creatinine, and left ventricular dysfunction, all of which are more prevalent among patients with AF than those without AF. These observations demonstrate that the coexistence of AF and SVA is common and that the presence of AF is associated with a lower long-term survival rate. Awareness of this association may facilitate early diagnosis and management of AF in patients with other forms of SVA.

Conflicts of interests: Although there are no specific conflicts of interests relevant to this study, the authors’ relationships with pharmaceutical companies or biomedical device manufacturers are disclosed here. Dr Ozcan: None. Dr Strom: None. Mr Newell: None. Dr Mansour: Consulting Fees/Honoraria from Biosense Webster, Inc. and St. Jude Medical; Research Grants from St. Jude Medical, Endosense, Voyage Medical, MC10 Inc. and Biosense Webster, Inc. Dr Ruskin: Consulting Fees/Honoraria from Biosense Webster, Inc., Medtronic, Inc., Atricure, Advanced Medical Education, Inc., Astellas/Cardiome, Bristol Myers Squibb, Pfizer, Sanofi-Aventis and Third Rock Ventures.; Fellowship Support from Medtronic, Biosense Webster, Boston Scientific and St. Jude Medical.
References