Catheter Ablation for Atrial Fibrillation in Patients With Obesity

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Background—Obesity is a risk factor for atrial fibrillation and other cardiovascular conditions. Our objective was to determine whether catheter-based ablation effectively treated atrial fibrillation in obese patients.

Methods and Results—Five hundred twenty-three consecutive patients with symptomatic, medication-refractory atrial fibrillation underwent catheter ablation. Patients were grouped by body mass index (lean, <25 kg/m²; overweight, 25 to 29.9 kg/m²; obese, ≥30 kg/m²). Outcome and quality of life were measured with a general health survey (Medical Outcomes Study 36-item Short-Form General Health Survey [SF-36]); patients were assessed before ablation and at 3 and 12 months after the procedure. Two hundred twenty-eight study patients (44%) were overweight, and 201 (38%) were obese. Twelve months after curative ablation, 72% of patients were free of atrial fibrillation without the use of antiarrhythmic agents; 84% were arrhythmia free when those receiving medication were included. Atrial fibrillation was eliminated in 75%, 72%, and 70% of the lean, overweight, and obese patients, respectively, at 12 months (P=0.41, trend test). SF-36 scores were lower for patients with higher body mass index (P<0.05) at baseline. SF-36 scores improved in every functional domain for all body mass index groups after ablation. The mean SF-36 total physical score increased from 59±20 at baseline to 77±19 in 12 months (P<0.001). The total mental health score improved from 66±18 to 79±16 in 12 months (P<0.001).

Conclusions—Catheter ablation of atrial fibrillation was effective in obese patients. Coexistence of atrial fibrillation and obesity indicated lower SF-36 scores, but the improvement in quality of life was consistent across all body mass index categories. (Circulation. 2008;117:2583-2590.)

Key Words: atrial fibrillation • catheter ablation • obesity • quality of life

Obesity has reached epidemic proportions in the United States; nearly 65% of the population is overweight, and 31% is obese. Obesity clearly is associated with increased prevalence of hypertension, coronary artery disease, diabetes mellitus, obstructive sleep apnea, and congestive heart failure. These comorbid conditions may contribute to the development of atrial fibrillation (AF), the most commonly encountered sustained arrhythmia. Recently, in an analysis of Framingham study data, Wang et al reported that obesity is an independent risk factor for AF and is associated with an overall 50% increase in the risk of AF development. The propensity of the obese population to develop AF is attributable to left ventricular diastolic dysfunction and left atrial dilatation.

Clinical Perspective p 2590

Over the past decade, pulmonary vein (PV) isolation or left atrial circumferential ablation has been shown to be an effective treatment for patients with AF. Approximately three fourths of patients treated with ablation have achieved freedom from AF. However, whether catheter-based ablation has similar efficacy when treating obese patients with AF is unknown. The objective of this study was to determine whether there was a differential efficacy of catheter-based ablation for AF on the basis of patient body mass index (BMI).

Methods

Patient Population
We included 523 consecutive patients with highly symptomatic AF who underwent radiofrequency ablation at the Mayo Clinic electrophysiology laboratory and completed a minimum follow-up of 3 months. These patients were enrolled from November 2000 through June 2005, and follow-up care was provided through October 2006. Data were collected prospectively and entered into a central database. AF was considered paroxysmal if episodes were self-terminating, persistent if episodes required chemical or electric stimulation, and persistent if episodes lasted longer than 7 days. Ablation was considered curative if no antihyperarrhythmic drug was required and if atrial fibrillation was not detected by 24-hour Holter monitoring or during exercise testing at follow-up. Body mass index was calculated as weight (kg)/height (m)².
cardioversion for termination or lasted 30 to 180 days without attempted termination, or permanent if electric cardioversion failed or if AF was present continuously for at least 6 months.

BMI was determined for all patients. BMI was calculated by dividing body weight in kilograms by the square of the height in meters. Patients were categorized as lean (BMI, ≤25 kg/m²), overweight (BMI, 25 to 29.9 kg/m²), or obese (BMI, ≥30 kg/m²) at the time of ablation.16 This study was approved by the Mayo Clinic Institutional Review Board.

Clinical Evaluation

Before ablation, all patients underwent clinical evaluation that included (1) a detailed history and physical examination; (2) a 12-lead ECG examination; (3) 24-hour Holter monitoring to assess presence, frequency, and duration of AF; (4) chest radiography; (5) chest multislice computed tomography and 3-dimensional reconstruction to define PV anatomy; (6) a baseline ventilation-perfusion scan for comparison with postprocedural scans (to detect perfusion impairment resulting from PV stenosis); and (7) transesophageal echocardiography. Echocardiography was performed to assess left ventricular function, left atrial size, PV anatomy, and flow velocity and to exclude intracardiac thrombi.

Procedure and Radiofrequency Ablation

Catheter Placement

All patients received general anesthesia during ablation. Standard catheterization was performed by placing catheters (5F to 7F) into the right ventricle, right atrium, coronary sinus, and His bundle region from the femoral veins and right internal jugular vein. Left atrial access was achieved by use of a double transseptal puncture technique. A 10-pole circular mapping catheter (Lasso, Biosense Webster, Inc, Diamond Bar, Calif) was advanced through 1 transseptal sheath to a specific PV and mapped potentials at the PV orifice. An ablation catheter was advanced through the second transseptal sheath. One or 2 pediatric esophageal temperature probes were placed in the esophagus to establish the esophageal location and to monitor temperature changes. Patients received heparin before the transseptal puncture and throughout the ablation procedure to maintain an activated clotting time of 300 to 350 seconds. All surface and intracardiac ECG data were transmitted to a Prucka CardioLab 48-channel electrophysiology monitoring system (GE Healthcare, Waukesha, Wis). Femoral artery pressure was monitored throughout the ablation procedure.

Intracardiac Echocardiography

A 10F intracardiac ultrasound catheter (ACUSON AcuNav, Siemens Medical Solutions USA, Inc, Malvern, Pa) was inserted through the right femoral vein and positioned in the right atrium. It was used to monitor the area for development of complications such as a pericardial effusion.

AF Ablation

Two ablation techniques were used in this study. During Lasso-guided circumferential PV isolation, ablation was guided exclusively by a Lasso catheter positioned at the PV orifice by use of intracardiac echocardiographic guidance. Radiofrequency energy was delivered to the atrial tissue near the venous atrial junction. The radiofrequency energy was applied at a maximum temperature of 50°C and a maximum power of 30 W with a 5-mm-tip ablation catheter (EPT Blazer II, Boston Scientific, Natick, Mass) for isolation of PV ostia. Radiofrequency energy was delivered for 15 to 30 seconds at each site.

In patients undergoing wide-area circumferential ablation, PV anatomy and an electroanatomic map of the left atrium were rendered with an electroanatomic navigation system (Carto XP Navigation System, Biosense Webster, Inc). Ablation was accomplished by creating a wide-area circumferential ring of lesions that were 5 to 15 mm away from the venoatrial junctions of the left and right PVs. The radiofrequency energy was delivered at a maximum temperature of 50°C and a maximum power of 35 W with an 8-mm-tip catheter (Biosense Webster, Inc). A “drag” technique was used to deliver the radiofrequency energy and to create linear lesions. Additional (“touch-up”) ablation of residual PV potentials, guided by the Lasso catheter, was undertaken when arrhythmogenic PV potentials remained. Linear lesions from the left inferior PV ring to the mitral valve annulus were created at the operator’s discretion, most commonly in patients with persistent or permanent AF. Non-PV foci were sought by infusing isoproterenol intravenously (2 to 6 μg/min), repeating AF induction and cardioversion (to identify any early recurrent AF), and performing additional ablation as indicated, most commonly at the superior vena cava, vein of Marshall, or the coronary sinus. All patients also underwent cavotricuspid isthmus ablation to create a bidirectional conduction block.

Patient Follow-Up

Patients were hospitalized for at least 24 hours after the ablation procedure for continuous monitoring of heart rhythm. The day after ablation, all patients were evaluated with ECGs and chest radiography. Patients were dismissed and received β-blockers or calcium channel blockers. Patients with early recurrence of AF and patients with a history of persistent or permanent AF received antiarrhythmic agents. Duration of therapy was at least 2 to 3 months to promote maintenance of sinus rhythm and reverse atrial remodeling.

Patients were instructed to return for follow-up 3 months after ablation. The follow-up evaluation consisted of a detailed history, physical examination, 12-lead ECG examination, 24-hour Holter monitoring, computed tomographic scan of the chest, and ventilation-perfusion scintigraphy. Telephone follow-up, event monitoring, and additional testing were performed as needed for patients with recurrent AF or other problems. Afterward, patients were asked to complete an annual survey about clinical symptoms and recurrent AF.

Assessment of Quality of Life

Quality of life (QoL) was evaluated with the Medical Outcomes Study 36-item Short-Form General Health Survey (SF-36) (Medical Outcomes Trust, Waltham, Mass).11 The SF-36 survey was used to assess 8 aspects of health status: general health, mental health, physical function, social function, physical role, emotional role, pain, and vitality. By using this scoring system, we intended to establish a connection between objective physiological measures (eg, frequency, duration, and intensity of AF episodes) and subjective perceptions of illness or QoL. Questionnaires were completed before ablation and 3 and 12 months after ablation.

Statistical Analysis

Continuous variables are presented as mean±SD. Patients were categorized by BMI, and characteristics of BMI groups were compared by use of Kruskal-Wallis tests. Categorical variables were assessed with a χ² test. Univariate and multivariate logistic regression analysis was performed to evaluate predictors of AF recurrence. The multivariate model was constructed by including all the univariate factors and performing a stepwise selection technique. Values of P<0.05 were considered significant.

The authors had full access to and take responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

Results

Patient Characteristics

Patient characteristics, categorized by BMI, are shown in Table 1. Three hundred one patients (58%) had paroxysmal AF, and 221 patients (42%) had persistent or permanent AF. The mean duration of AF; the number of failed antiarrhythmic agents; and the concurrence of hypertension, diabetes mellitus, structural heart disease (including coronary artery
Achieved freedom from AF with antiarrhythmic agents. The agents (AF elimination); an additional 50 patients (12%) (72%) were free of AF and did not require antiarrhythmic agents. During a follow-up period of 12 months, 311 of 432 patients were free of AF (94%).

**Ablation Outcome**

During a follow-up period of 12 months, 311 of 432 patients (72%) were free of AF and did not require antiarrhythmic agents (AF elimination); an additional 50 patients (12%) achieved freedom from AF with antiarrhythmic agents. The AF elimination rates, categorized by BMI, are shown in Figure 1. AF was eliminated in 75% (60 of 80), 72% (139 of 192), and 70% (112 of 160) of the lean, overweight, and obese patients, respectively (P=0.41, trend test). The 95% CI for the percentage difference in AF elimination between obese and lean patients was −6.9% to 16.9% (P=0.42). Between overweight and lean patients, the 95% CI was −8.4% to 14.4% (P=0.61).

At 24 months, 72% (212 of 296) and 83% (247 of 296) of patients were free of AF without and with antiarrhythmic agents, respectively. AF was eliminated in 74% (45 of 61), 73% (95 of 130), and 69% (72 of 105) of the lean, overweight, and obese groups, respectively (P=0.43, trend test). The 95% CI for the percentage difference in AF elimination between obese and lean patients was −9.1% to 19.1% (P=0.49). Between overweight and lean patients, the 95% CI was −12.3% to 14.4% (P=0.88). Although no statistically significant difference among the 3 BMI groups was mea-

### Table 1. Baseline Patient Characteristics, Procedures, and Complications

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All Patients (N=523)</th>
<th>BMI, kg/m²</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>&lt;25.0 (n=94)</td>
<td>25.0–29.9 (n=228)</td>
</tr>
<tr>
<td>Male sex, n (%)</td>
<td>439 (84)</td>
<td>72 (77)</td>
</tr>
<tr>
<td>Age, y</td>
<td>54±10</td>
<td>55±12</td>
</tr>
<tr>
<td>Paroxysmal AF, n (%)</td>
<td>301 (58)</td>
<td>64 (68)</td>
</tr>
<tr>
<td>Persistent or permanent AF, n (%)</td>
<td>221 (42)</td>
<td>30 (32)</td>
</tr>
<tr>
<td>Duration of AF, y</td>
<td>6.4±5.9</td>
<td>6.2±5.3</td>
</tr>
<tr>
<td>Antiarhythmic agents before ablation, n (%)</td>
<td>2.1±1.3</td>
<td>1.9±1.2</td>
</tr>
<tr>
<td>Hypertension, n (%)</td>
<td>180 (34)</td>
<td>19 (20)</td>
</tr>
<tr>
<td>Diabetes mellitus, n (%)</td>
<td>28 (5)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Structural heart disease, n (%)</td>
<td>114 (22)</td>
<td>12 (13)</td>
</tr>
<tr>
<td>Sleep apnea, n (%)</td>
<td>71 (14)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Left atrial enlargement, n (%)</td>
<td>341 (65)</td>
<td>57 (61)</td>
</tr>
<tr>
<td>Left ventricular ejection fraction, %</td>
<td>58±9</td>
<td>58±10</td>
</tr>
<tr>
<td>Nonpulmonary vein foci, n (%)</td>
<td>120 (23)</td>
<td>28 (30)</td>
</tr>
<tr>
<td>Pulmonary vein isolation, n (%)</td>
<td>298 (57)</td>
<td>61 (65)</td>
</tr>
<tr>
<td>Wide-area circumferential ablation, n (%)</td>
<td>222 (42)</td>
<td>33 (35)</td>
</tr>
<tr>
<td>Treatment with β-blockers, n (%)</td>
<td>169 (32)</td>
<td>30 (32)</td>
</tr>
<tr>
<td>Treatment with calcium channel blockers, n (%)</td>
<td>61 (12)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Treatment with antiarrhythmic agents, n (%)</td>
<td>125 (24)</td>
<td>20 (21)</td>
</tr>
</tbody>
</table>

**Procedures**

- **RF ablation time, min**
  - 53±26
- **Duration of fluoroscopy, min**
  - 69±51
- **Duration of procedure, min**
  - 116±66
- **Radiation exposure, Gy**
  - 1.44±1.42

**Serious complications, n (%)**

- **Stroke or transient ischemic attack, n (%)**
  - 4 (1)
- **Hemidiaphragm paralysis, n (%)**
  - 4 (1)
- **Pulmonary vein stenosis, n (%)**
  - 7 (1)
- **Tamponade, n (%)**
  - 12 (2)

*RF indicates radiofrequency.

*Pulmonary vein stenosis was defined as at least 50% lumen narrowing, as shown by axial and coronal views of the chest computed tomographic image.

disease, valvular heart disease, cardiomyopathy, and congestive heart failure), and sleep apnea are shown in Table 1.

The mean BMI was 29.3±5.3 kg/m². Forty-four percent of study patients were overweight, and 38% were obese. Patients with high BMI were younger (P=0.005) and more likely to have persistent or permanent AF (P<0.001), hypertension (P<0.001), diabetes mellitus (P<0.001), structural heart disease (P=0.02), sleep apnea (P<0.001), and left atrial enlargement (P=0.02). No differences were found for patient sex, duration of AF, the number of previously failed antiarrhythmic agents, and left ventricular ejection fraction among BMI groups.
Predictors of Recurrent AF After Ablation

Univariate analysis showed an increased likelihood for AF recurrence by 12 months for patients with a younger age, longer history of AF, and a high number of failed antiarrhythmic medications (Table 2). The presence of hypertension reduced the risk of AF recurrence. BMI was not associated with increased risk of AF recurrence. The ablation technique used did not affect the outcome. We also questioned whether obesity and ablation technique showed an interaction in the logistic model for outcome. However, the interaction between obesity and technique was not significant (P=0.36). Multivariate analysis showed that AF duration was the only risk factor associated with AF recurrence (odds ratio [OR], 1.04; 95% CI, 1.01 to 1.08; P=0.02). Higher left ventricular ejection fraction (OR, 0.98; 95% CI, 0.96 to 1.00; P=0.04) and older age (OR, 0.97; 95% CI, 0.95 to 0.99; P=0.004) were associated with a lower risk of AF recurrence. Hypertension was not associated with a lower risk of AF recurrence after adjustment for other factors. The results of the univariate and multivariate models for AF recurrence after 24 months of follow-up were similar.

QoL Outcome

The baseline scores for the SF-36 survey are shown in Table 3. Significant differences in general health, mental health, physical function, social function, emotional role, pain, and vitality scores were seen across the 3 BMI groups (P<0.05, ANOVA). Mean scores for specific SF-36 functional domains decreased as BMI increased (P<0.05). The highest BMI group had the lowest overall physical and mental health scores (P<0.001). The multivariate model showed that age, diabetes mellitus, persistent or permanent AF, structural heart disease, and BMI were significantly associated with the overall physical and mental scores. After adjustment for these variables, the BMI was still independently significant (P=0.01). After ablation, a marked improvement in SF-36 scores was seen across all BMI groups and multivariate models for AF recurrence after 24-month follow-up care at 3, 6, 12, 18, and 24 months are shown on the bottom. AF elimination rates were 75%, 72%, and 70% at the 12-month follow-up (P=0.52) and 74%, 73%, and 69% at the 24-month follow-up for lean, overweight, and obese patients, respectively (P=0.58).

![Figure 1. AF elimination rates stratified by BMI. The numbers of patients who received follow-up care at 3, 6, 12, 18, and 24 months are shown on the bottom. AF elimination rates were 75%, 72%, and 70% at the 12-month follow-up (P=0.52) and 74%, 73%, and 69% at the 24-month follow-up for lean, overweight, and obese patients, respectively (P=0.58).](http://circ.ahajournals.org/)

### Table 2

<table>
<thead>
<tr>
<th>BMI, kg/m²</th>
<th>No. of patients evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25</td>
<td>94</td>
</tr>
<tr>
<td>25-29.9</td>
<td>228</td>
</tr>
<tr>
<td>≥30</td>
<td>105</td>
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</table>

The rate of patients lost to follow-up (ie, the dropout rate) among BMI groups was not significantly different at 12 months (trend analysis, P=0.18), but the rates were different at 24 months (35%, 43%, and 48% in lean, overweight, and obese groups, respectively; P=0.04). The AF recurrence rate among the 3 groups was not significantly different, assuming the same recurrence rate in patients lost to follow-up as in patients with 24 months of follow-up (25%, 28%, and 30% in lean, overweight, and obese groups, respectively; P=0.31). Alternatively, to assess the worst-case scenario, if we assume that the AF recurrence rate was 10% higher in obese patients who left the study compared with those who had follow-up care, we still observed no significant difference in AF recurrence among the 3 groups (26%, 31%, and 36% recurrence in lean, overweight, and obese groups, respectively; P=0.08). This suggests that patients lost to follow-up did not substantively affect the results.

Figure 1.

![AF elimination rates stratified by BMI. The numbers of patients who received follow-up care at 3, 6, 12, 18, and 24 months are shown on the bottom. AF elimination rates were 75%, 72%, and 70% at the 12-month follow-up (P=0.52) and 74%, 73%, and 69% at the 24-month follow-up for lean, overweight, and obese patients, respectively (P=0.58).](http://circ.ahajournals.org/)
Obesity and AF commonly coexist. In our patient series, 44% who underwent catheter ablation for AF were overweight, and nearly 40% were obese. Percutaneous catheter ablation effectively restored sinus rhythm across a wide range of BMIs; 2 years after ablation, 70% of patients were free of AF in the absence of antiarrhythmic agents. Restoration of sinus rhythm by catheter ablation was associated with improved QoL across all BMI categories despite lower baseline SF-36 scores in the obese group.

Features Contributing to AF in Obesity
The prevalence of excess weight or obesity among patients who underwent catheter ablation at our institution for highly symptomatic, medication-refractory AF was greater than that reported for the general US population. This observation further supports the association between arrhythmia and excess weight. Our study confirms the high prevalence of hypertension, diabetes mellitus, structural heart disease, and sleep apnea associated with increased BMI. In turn, these cardiac diseases or conditions are important contributors to AF development. As noted in a recent Framingham Heart Study report, the risk of developing AF increased by 4% for every 1-unit increase in BMI for men and women. The excessive risk of AF associated with obesity may be mediated by left atrial dilation. Indeed, an enlarged left atrium and persistent or permanent AF were present more often in obese than lean patients in our study. Elevated atrial filling pressure (resulting from ventricular diastolic dysfunction) and increased circulating volume (necessitated by a large body mass) may be the underlying pathophysiological causes of atrial enlargement that predispose patients to development of AF. Adipokines produced from adipocytes are inflammation-related proteins that may contribute to the atrial substrate remodeling that perpetuates AF.

Outcome of AF Ablation in Obese Patients
Catheter-based ablation is an established treatment method for patients with arrhythmia. Despite the high prevalence
of obesity among patients with AF, the effect of BMI or obesity on catheter ablation has not been reported. We had anticipated that the persistence of obesity and its arrhythmogenic sequelae after ablation might diminish success rates. However, we determined that catheter ablation was an efficacious method of restoring sinus rhythm across all BMI categories, although we observed a weak trend toward reduced efficacy in the most obese patients. Freedom from AF without antiarrhythmic agents was achieved in 70% of study patients, even after an extended follow-up period of 2 years. A higher dropout rate in the obese group at 24 months did not appear to have a significant effect on the overall ablation outcome of this study. This finding indicates that ablation is a reasonable option in the armamentarium of therapies for obese patients with AF.

We found that longer AF duration predicted a higher recurrence rate of AF after ablation. Obesity was associated with a higher prevalence of AF, but it was not an independent predictor of AF recurrence in this study. The association between older age and lower recurrence of AF might have occurred because older patients in this study were less likely to be obese or to have permanent AF.

**Improvement in QoL**

Patients with AF, whether paroxysmal or persistent, have lower SF-36 scores for physical and mental function than healthy individuals. The impairment in QoL for patients with AF is similar in magnitude to that of patients who have had a myocardial infarction. Cardiac symptoms such as palpitations, dyspnea, dizziness, and chest pain associated with AF are predictive of impaired QoL. Studies of the relationship between BMI and health-related QoL show that obesity specifically lowers QoL scores.

To the best of our knowledge, assessment of QoL in obese patients with AF has not been reported previously. We found that patients with the highest BMI had the lowest SF-36 scores for most physical and mental function domains. This suggests that AF may have a greater deleterious impact on obese individuals compared with lean individuals. The lower SF-36 score likely reflected a lower feeling of well-being (physical and mental condition) because of the increased BMI and associated comorbid conditions. BMI was independently associated with lower SF-36 ratings after adjustment for comorbid conditions by multivariate analysis. A similar degree of improvement for all SF-36 functional domains was achieved across all BMI categories after AF ablation. The improvement in QoL appears to be attributable to restoration and maintenance of sinus rhythm. Overall, an 18-point increase in the total physical score and a 13-point increase in the total mental score were achieved by patients in this study. A 5-point increase in SF-36 scores is considered a clinically significant improvement. This substantial positive effect on QoL after catheter ablation for lean and obese patients was encouraging in that there is a growing appreciation that subjective, patient-perceived dimensions of the severity of an illness are important considerations in weighing the benefits and risks of the ablation therapy.

**Complications**

Obese patients who underwent prolonged ablation procedures were at greater risk for the development of complications because of their comorbid conditions. Hemodynamic intolerance to the general anesthesia, difficulty with endotracheal intubation and vascular access, radiation exposure, and risk of stroke are concerns. We found that the procedure duration was longer for patients with higher BMI. The amount of radiation exposure for obese patients was nearly 3 times that for lean patients. Our observation was consistent with a recent report from Ector et al. who showed that BMI is a major determinant of radiation exposure in patients undergoing PV isolation. As a result, mean attributable lifetime risk of all-cause mortality was likely increased. Our findings showed
that the amount of radiation exposure was lower with wide-area circumferential ablation. This important finding highlights one of the advantages of this technique, especially for obese patients. The lower radiation exposure with this technique likely was attributable to the use of nonfluoroscopic navigation tools. The risk of serious complications attributable to the ablation was similar among lean, overweight, and obese patients. With careful periprocedural management, adverse effects from the ablation may be minimized for obese patients, despite the higher incidence of comorbid cardiovascular conditions in this population.

Study Limitations

This observational study was performed at a single center. The wide-area circumferential ablation technique was used more often in obese patients. The ablative techniques potentially could affect outcomes. However, these techniques reflected the current clinical practice in the absence of an established and standardized approach. Multivariate analysis showed that the ablative technique used (wide-area circumferential ablation or PV isolation) was not an independent predictor of outcome. Although the efficacy data (recorded by Holter monitors and event monitors) reflected elimination of all symptomatic AF and asymptomatic arrhythmia, we cannot exclude the possibility that asymptomatic AF occurred between episodes of monitoring. Extended ECG monitoring was not performed with every patient. Nonetheless, the improved QoL indicated a clinically significant effect of the therapy. We observed a weak but statistically nonsignificant trend toward reduced procedural efficacy in the most obese patients from this large, single-center study. As seen by the width of the 95% CIs, we cannot exclude the possibility that a clinically meaningful difference in ablation outcome exists among the 3 BMI categories. A difference may have been undetected because the study was not powered to detect equivalence. With our current sample sizes and 80% power, the difference in AF recurrence that we could detect between the obese and lean groups was 22%. A larger patient population would clarify this question.

Conclusions

Most patients who underwent catheter ablation therapy for symptomatic AF were obese or overweight. This population had lower SF-36 scores for QoL than lean patients with AF. Catheter ablation restored sinus rhythm and improved QoL for all BMI groups. Obese patients with AF had the same degree of improvement as nonobese patients. Ablation should not be discouraged when treating obese and overweight patients to control arrhythmia and to improve QoL.

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Disclosures

Dr Friedman has received a research grant from Bard for licensed IP for AF ablation. The other authors report no conflicts.

References


13. Powell BD, Redfield MM, Bybee KA, Freeman WK, Rihal CS. Asso-


21. Pritchett AM, Jacobsen SJ, Mahoney DW, Rodeheffer RJ, Bailey KR, Redfield MM. Asso-


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