Risk factors for atrial fibrillation incidence and progression
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Chapter 7

Obesity is Associated with Impaired Left Atrial Function in Young Patients with Recent Onset Atrial Fibrillation

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Obesity is a risk factor for atrial fibrillation (AF). However, the exact pathogenesis underlying this association is unknown. We investigate the relation between obesity and left atrial function, measured with echocardiographic strain analysis, in young patients with recent onset AF.

We studied 89 patients of the Phenotyping Young-Onset Atrial Fibrillation Patients (Young AF) study. The Young AF study is a single-center observational prospective study performed in a tertiary referral center. Consecutive patients with an AF history <3 years who developed AF before age 60 years and with sinus rhythm during echocardiography were included in the present analysis. The institutional review board approved the study protocol. All patients gave written informed consent. Detailed clinical information was collected. All patients underwent a standard two-dimensional transthoracic echocardiogram (General Electric Vivid E9) during continuous ECG monitoring. Left atrial strain was measured using speckle tracking by two observers. Three strain-patterns (reservoir, activation, and conduit strain) representing left atrial functional phases were measured.

Of the 89 patients, 30 were obese (body mass index >30 kg/m²) and 59 were non-obese (34±3 vs. 25±2kg/m², p<0.001; Table). There were no differences in median age, male sex, paroxysmal AF, total history of AF, hypertension, previous myocardial infarction, heart failure or previous stroke. However, diabetes mellitus was more common in obese patients (4[13%] vs. 1[2%], p=0.042). Left atrial volume indexed for body surface area, left ventricular mass indexed for body surface area, left ventricular ejection fraction and E/Et were not significantly different between obese and non-obese patients. However, the left atrial reservoir function (28±6 vs. 32±9%, p=0.020) was significantly reduced in obese patients. The left atrial activation strain and conduit strain were not statistically different between obese and non-obese. Using univariate linear regression analysis, there was a significant association between body mass index and all 3 strain patterns (Figure). In multivariate analysis adjusting for the baseline difference in diabetes mellitus and other relevant covariates (age, sex, hypertension, heart failure, myocardial infarction, left atrial volume index, left ventricular mass index, E/Et) the association between body mass index and reservoir strain (beta=-0.271, R=0.468, p=0.036) remained significant. Conduit strain (beta=-0.254, R=0.459, p=0.051) and left atrial activation strain (beta=-0.145, R=0.475, p=0.257) were not associated with body mass index in multivariate analysis.

We found that in young patients with recent onset AF, obesity is associated with impaired left atrial reservoir function, without differences in atrial volume. Reservoir strain was lower in both AF groups than in a previous report in healthy controls (45.5±11.4%).

The mechanistic link between obesity and atrial remodeling is multifactorial, and includes direct pro-fibrotic effects of epicardial adipose tissue, fatty infiltration of atrial myocardium, but also shared risk factors such as hypertension, diabetes mellitus and obstructive sleep apnea syndrome. It has been previously shown in non-AF
populations that left atrial function may be impaired in the presence of comorbidities before atrial dilatation occurs.(6,7) A previous study in a population with a longer history of AF (mean AF duration 5 years) showed that atrial function was reduced in obese patients compared to patients with normal weight.(8) However, no adjustment were made for baseline differences in comorbidities. Our results indicate that even in young patients with recent onset AF, obesity is independently associated with impaired left atrial reservoir function. Of interest, recent data showed that weight loss did not only reduce AF burden, but also reduced cardiac remodeling and pericardial adipose tissue on magnetic resonance imaging.(9) These findings may have the greatest clinical consequences in young early-AF patients, in whom further atrial remodeling and hence AF progression may be prevented.(10)

Our data show that early signs of atrial remodeling, without atrial dilatation yet, are present in obese patients independent of other AF risk factors. This again stresses that future research on improvement of rhythm control therapy should also embrace lifestyle changes including weight reduction in obese patients, instead of concentrating only on pharmacological and non-pharmacological therapeutic approaches.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Obese (n=30)</th>
<th>Non-obese (n=59)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age–years</td>
<td>51(47-55)</td>
<td>53(45-56)</td>
<td>0.22</td>
</tr>
<tr>
<td>Male sex</td>
<td>17(57%)</td>
<td>42(71%)</td>
<td>0.17</td>
</tr>
<tr>
<td>BMI–kg/m²</td>
<td>34±3</td>
<td>25±2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Paroxysmal AF</td>
<td>25(83%)</td>
<td>48(81%)</td>
<td>0.82</td>
</tr>
<tr>
<td>Total history of AF</td>
<td>1.5±0.9</td>
<td>1.4±1.1</td>
<td>0.73</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>4(13%)</td>
<td>1(2%)</td>
<td>0.042</td>
</tr>
<tr>
<td>Hypertension</td>
<td>16(53%)</td>
<td>20(34%)</td>
<td>0.08</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>3(10%)</td>
<td>1(2%)</td>
<td>0.11</td>
</tr>
<tr>
<td>Heart failure</td>
<td>-</td>
<td>3(5%)</td>
<td>0.55</td>
</tr>
<tr>
<td>Previous stroke</td>
<td>2(7%)</td>
<td>2(3%)</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Mean±standard deviation, median (interquartile range) or numbers (%). Abbreviations: AF=atrial fibrillation; BMI=body mass index; LA=left atrial; LV=left ventricular.
Obesity and impaired LA function in young onset AF

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Figure. Association between body mass index and left atrial strain measurements, using univariate linear regression analysis.
REFERENCES


