Imaging Based Analysis of Patients with Atrial Fibrillation

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The ATRIA
Fibrillation
Flutter
What is Atrial Fibrillation?

= Afib = AF

Normal Contraction

Atrial Fibrillation
AF Prevalence

We All Get Older

Projected Number of Persons With AF (millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Current age-adjusted AF incidence</th>
<th>Increased age-adjusted AF incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>5.1</td>
<td>5.1</td>
</tr>
<tr>
<td>2005</td>
<td>5.9</td>
<td>5.6</td>
</tr>
<tr>
<td>2010</td>
<td>6.7</td>
<td>6.1</td>
</tr>
<tr>
<td>2015</td>
<td>7.7</td>
<td>6.8</td>
</tr>
<tr>
<td>2020</td>
<td>8.9</td>
<td>7.5</td>
</tr>
<tr>
<td>2025</td>
<td>10.2</td>
<td>8.4</td>
</tr>
<tr>
<td>2030</td>
<td>11.7</td>
<td>9.4</td>
</tr>
<tr>
<td>2035</td>
<td>13.1</td>
<td>10.3</td>
</tr>
<tr>
<td>2040</td>
<td>14.3</td>
<td>11.1</td>
</tr>
<tr>
<td>2045</td>
<td>15.2</td>
<td>11.7</td>
</tr>
<tr>
<td>2050</td>
<td>15.9</td>
<td>12.1</td>
</tr>
</tbody>
</table>

AF Prevalence

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Women (n=7,801)</th>
<th>Men (n=10,173)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;55</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>55-59</td>
<td>0.4</td>
<td>0.9</td>
</tr>
<tr>
<td>60-64</td>
<td>1.0</td>
<td>1.7</td>
</tr>
<tr>
<td>65-69</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>70-74</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>75-79</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>80-84</td>
<td>7.3</td>
<td>7.2</td>
</tr>
<tr>
<td>&gt;85</td>
<td>10.3</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td>11.1</td>
<td>11.1</td>
</tr>
</tbody>
</table>

So What?

20% of Strokes

$20 billion/year
What Causes AFib?

Substrate

+

Trigger
Substrate: Fibrosis


Complex Propagation

de Groot, ..., Allessie MA. Circ. 2010: 1674-1682.
Substrate: Extension of muscle sleeves

Triggers

Left Atrium

Pulmonary Veins
Clinical Result

Normal conduction

Atrial fibrillation

SA Node

Normal electrical signals

Disorganized electrical signals
Treatment?

Catheter Ablation
Imaging in AF

Imaging Modalities in AF

Fluoroscopy

Ultrasound

Real time MRI

MR Angiography

Electroanatomical

R Angiography
Late Gadolinium Enhancement

Pre-treatment 3 month Post

Patient Workflow

Evaluation → Treatment → Followup
Fibrosis and Outcome

Utah Scoring Scheme

Fibrosis Image Analysis

Past Workflow

Evaluation
Corview Evaluation