Left Atrial Appendage Exclusion for Prevention of Stroke in Atrial Fibrillation

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Atrial fibrillation (A-fib) is the most common sustained arrhythmia worldwide

Estimated to affect > 5 million Americans

Incidence increases with age (8-10% of octogenarians)
Background

- Causes 5-fold increase in risk of stroke
- Responsible for 15% of all strokes, more than 30% of strokes in octogenarians
- Strokes related to A-fib more severe
  - 50% > severe long-term disability
  - 50% > fatal event
# CHADS$_2$

## Table 1

<table>
<thead>
<tr>
<th>CHADS$_2$ Risk</th>
<th>Score</th>
<th>Total CHADS$_2$ Score</th>
<th>Adjusted stroke rate %/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>1</td>
<td>1</td>
<td>2.8</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>Age &gt;75</td>
<td>1</td>
<td>3</td>
<td>5.9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
<td>4</td>
<td>8.5</td>
</tr>
<tr>
<td>Stroke or TIA</td>
<td>2</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>18.2</td>
</tr>
</tbody>
</table>

*CHF = congestive heart failure; TIA = transient ischemic attack.*
Stroke Prevention

- Oral anticoagulation (OAC) with warfarin has been traditional cornerstone of stroke prophylaxis

- Reduces stroke by 64%, mortality by 26%
Stroke Prevention: Warfarin

• 30-50% of eligible pts do not receive OAC due to absolute or relative contraindications

• Drug-drug and drug-food interactions

• Narrow therapeutic window, need for frequent monitoring

• Bleeding risk of 2.1-3.6% per year

• Time in therapeutic range only 50-60%
Stroke Prevention: NOAC’s

- Novel oral anticoagulants (NOAC’s)
  - No need for monitoring
  - No dose adjustments
  - Fewer interactions
  - Less incidence of intracranial hemorrhage
Stroke Prevention: NOAC’s

• Caution with renal/hepatic impairment
• Most did not reduce overall risk of major bleeding
• 15-20% discontinuation rate in clinical trials
• Still concerns with falls, DAPT, non-compliance
Role of LAA

- According to autopsy, surgical and TEE studies, >90% of left atrial thrombi in A-fib originate in the left atrial appendage (LAA)
LAA Thrombus
LAA Thrombus
LAA Thrombus
Surgical Exclusion

- LAA often ligated or excised during open heart procedures performed for other reasons (CABG, MVR, etc)
- Too invasive for a “stand-alone” procedure
- Excision/exclusion often incomplete
Surgical Exclusion
### Table 1. Comparison of Surgical Left Atrial Appendage Closure Techniques

<table>
<thead>
<tr>
<th>First Author, Year</th>
<th>Country</th>
<th>No. Studied</th>
<th>Method of Closure</th>
<th>Closure Success Rate, %</th>
<th>Effect of LAA Closure on Stroke Prevention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson, 2000 [25]</td>
<td>USA</td>
<td>437</td>
<td>Excision</td>
<td>100</td>
<td>Positive</td>
</tr>
<tr>
<td>Katz, 2000 [30]</td>
<td>USA</td>
<td>50</td>
<td>Endocardial suture</td>
<td>64</td>
<td>None</td>
</tr>
<tr>
<td>Garcia-Fernandez, 2003 [31]</td>
<td>Spain</td>
<td>205</td>
<td>Endocardial suture</td>
<td>90</td>
<td>Positive</td>
</tr>
<tr>
<td>Bando, 2003 [38]</td>
<td>Japan</td>
<td>812</td>
<td>Endocardial suture</td>
<td>Not measured</td>
<td>Negative</td>
</tr>
<tr>
<td>Blackshear, 2003 [45]</td>
<td>USA</td>
<td>15</td>
<td>Thoracoscopic epicardial pursestring</td>
<td>93(^b)</td>
<td>Positive</td>
</tr>
<tr>
<td>Pennec, 2003 [40]</td>
<td>France</td>
<td>30</td>
<td>Endocardial</td>
<td>70–80</td>
<td>Negative</td>
</tr>
<tr>
<td>Schneider, 2005 [41]</td>
<td>Germany</td>
<td>6</td>
<td>Excision</td>
<td>100</td>
<td>Positive</td>
</tr>
<tr>
<td>Healey, 2005 [28]</td>
<td>Canada</td>
<td>77</td>
<td>Endocardial suture</td>
<td>45</td>
<td>Positive</td>
</tr>
<tr>
<td>Kanderian, 2008 [29]</td>
<td>USA</td>
<td>137</td>
<td>Excision</td>
<td>73 (20% stapler)</td>
<td>Positive trend</td>
</tr>
<tr>
<td>Bakhtiar, 2008 [33]</td>
<td>Germany</td>
<td>259</td>
<td>Suture exclusion</td>
<td>23</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stapler</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clamp and epicardial suture</td>
<td>100(^b)</td>
<td>Positive</td>
</tr>
</tbody>
</table>

\(^a\) As assessed by transesophageal echocardiography.  
\(^b\) Remnant size not measured.

LAA = left atrial appendage.
Percutaneous Options
Percutaneous Options
Percutaneous Options

RA

IVC
Percutaneous Options

- RA
- IAS
- IVC
Percutaneous Options
PLAATO Device
PLAATO Device

- Safety and feasibility study of 111 pts in US and Europe
- Non-randomized
- All pts had contraindication to OAC (warfarin)
- All had CHADS$_2$ of $\geq$ 2 (mean = 2.5)

(J Am Coll Cardiol 2005;46:9 –14)
PLAATO Device

- Procedural success 97.3% (108 of 111)
- Five pts experienced pericardial effusions following implant
- Observed stroke rate vs predicted stroke rate of 3.8% / 6.6%, a 42% relative risk reduction
Watchman Device
Watchman Device

A

Left Atrial Appendage

Left Atrial Side

B

Left Atrial Surface
Watchman Device
Protect-AF

- Multi-center (non-inferiority) trial of 707 pts
- Randomized 2:1 to device (463) or continued warfarin therapy (244)
- CHADS\(_2\) of $\geq 1$ (mean=2.2)
- Successful implant in 90.9%
- Warfarin continued for 45 days post-implant, changed to clopidogrel for 4.5 months if no residual leak seen on TEE at 45 days
- Lifelong ASA following implant
PROTECT AF

Trial design: Patients with nonvalvular AF were randomized to percutaneous LA appendage closure with the WATCHMAN device followed by discontinuation of warfarin at 45 days (n = 463) vs. continued warfarin therapy (n = 244).

Results

- CV death, stroke, or systemic embolism: 3.0 events per 100 patient-years with closure vs. 4.9 events per 100 patient-years with control
- Hemorrhagic stroke: 1 vs. 6
- Composite safety outcome: 7.4 events per 100 patient-years vs. 4.4 events per 100 patient-years

Conclusions

- In nonvalvular AF patients, use of WATCHMAN for LA appendage closure is feasible
- Device demonstrated noninferior composite efficacy, although worse composite safety due to pericardial effusion

Prevail

• 407 pts randomized 2:1 (device vs warfarin)

• CHADS$_2$ $\geq$ 2 (or 1 if other certain high risk features were present) mean score 2.6 vs 2.2 in Protect AF

• 25% of pts were implanted by operators not participating in previous trial
**Trial design:** Patients with AF were randomized to percutaneous LAA closure with the WATCHMAN device (n = 269) vs. long-term warfarin therapy (n = 138).

**Results**
- CV/unexplained death, stroke, or systemic embolism at 18 months: 0.064% of the device group vs. 0.064% of the warfarin group. Upper one-sided confidence interval (1.88%) was higher than the prespecified criterion for success (1.75%)
- Stroke or systemic embolism from 7 days to 18 months: 0.025% of the device group vs. 0.020% of the warfarin group. Upper one-sided confidence interval (0.027%) was lower than the prespecified criterion for success (0.028%)

**Conclusions**
- LAA closure was noninferior to warfarin at preventing stroke or systemic embolism from 7 days to 18 months; however, noninferiority was not established in regard to CV/unexplained death, stroke, or systemic embolism at 18 months

*Dr. David Holmes, released March 9, 2013*
Amplatzer Cardiac Plug
Lariat
Summary
Summary

- Strokes from a-fib are bad
Summary

• Strokes from a-fib are bad
• OACs are not perfect
Summary

• Strokes from a-fib are bad
• OACs are not perfect
• Help is on the way
Thank you!