Clinical Case

• 76-year-old woman – paroxysmal atrial fibrillation
  – CHA$_2$DS$_2$VASc 6 (hypertension, age, female sex, stroke)
• Anticoagulation with rivaroxaban 20 mg daily
• Presents with severe acute GI bleeding requiring 2 PRBC transfusion – source could not be identified
Stroke Prevention Options

1. Change to dabigatran due to reversal agent
2. Switch to warfarin
3. Appendage occlusion using a Watchman device
4. Appendage ligation with Lariat
5. Surgical appendage ligation
The LAA

“Most Lethal Human Attachment”

NVAF - 91% of left atrial thrombi originate in the LAA\(^1\)

**Increased LAA flow in AF regardless of CHA\(_2\)DS\(_2\) VASc**

**Velocity in both LA-LAA**

**Stasis in both LA-LAA**

**Increase in pro-inflammatory factors (TF, PAI) compared with RAA\(^4\)**

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3. Zuo K Clin Cardiol 2017; 1–6
4. Breitenstein A International Journal of Cardiology Vol 185, 15 April 2015,
Trabecular LAA - remnant of the original embryonic left atrium
The main smooth walled left atrial cavity develops later from the outgrowth of the pulmonary veins
Pharmacologic Stroke Prevention - Limitations

- Compliance
- Side effects
- Bleeding/Contraindications
- Affordability

<table>
<thead>
<tr>
<th>Condition</th>
<th>Patients, No. (%) (N = 84,799)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk for anticoagulation</td>
<td>39,592 (47.0)</td>
</tr>
<tr>
<td>Age &gt; 85 years</td>
<td>22,451 (26.5)</td>
</tr>
<tr>
<td>Anemia</td>
<td>13,527 (16.0)</td>
</tr>
<tr>
<td>Prior gastrointestinal bleed</td>
<td>7973 (9.4)</td>
</tr>
<tr>
<td>Dementia</td>
<td>7102 (8.4)</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>2568 (3.0)</td>
</tr>
<tr>
<td>Hematological malignancy</td>
<td>1791 (2.1)</td>
</tr>
<tr>
<td>Traumatic intracranial hemorrhage</td>
<td>170 (0.2)</td>
</tr>
</tbody>
</table>

Out of pocket costs (cash price):
- Warfarin 5 mg 30 day supply: $9 (drug cost only)
- Dabigatran 150mg 30 day supply: $333.08
- Rivaroxaban 20mg 30 day supply: $301.54
- Apixaban 5mg 30 day supply: $155

Steinberg BA Cardiovasc Ther. 2015 August; 33(4): 177–183
Stroke prevention
Non-Pharmacologic – Mechanical LAA Closure

Surgical closure

Catheter based closure devices

Watchman device

Lariat suture
Stroke prevention
Non-Pharmacologic – Mechanical LAA Closure

- One time procedure
- No long term bleeding risk
- No compliance issues
Surgical LAA Closure

During open heart surgery
- Ligation
- Excision-suture

Thoracoscopic procedure
- Ligation
- Stapler occlusion

Cleveland Clinic 1993-2007
2546 pts had LAA ligated
137 post op TEE
40% of closures successful

Watchman Device
The Only LAA Occlusion Device Approved by FDA
Protect AF

A Primary efficacy end point

HR (95% CI), 0.61 (0.38-0.97)
P = .04

B Primary safety end point

HR (95% CI), 1.21 (0.78-1.94)
P = .41
Watchman Device Trials

CMS Coverage for Watchman

• A CHADS2 score ≥ 2 or CHA2DS2-VASc score ≥ 3

• A formal shared decision making interaction with an independent non-interventional physician using an evidence-based decision tool on oral anticoagulation in patients with NVAF prior to LAAC.

• A suitability for short-term warfarin but deemed unable to take long term oral anticoagulation following the conclusion of shared decision making, as LAAC is only covered as a second line therapy to oral anticoagulants.
Experience with Watchman to Date

Central Illustration: Major Complication Rates Across Watchman Clinical Studies

<table>
<thead>
<tr>
<th>Procedural Parameters</th>
<th>Aggregate Clinical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Procedures</td>
<td>6,720</td>
</tr>
<tr>
<td>Implantation Success, %</td>
<td>94.9%</td>
</tr>
<tr>
<td>Complication Rates</td>
<td></td>
</tr>
<tr>
<td>Pericardial Tamponade</td>
<td>1.24%</td>
</tr>
<tr>
<td>Procedure-Related Stroke</td>
<td>0.18%</td>
</tr>
<tr>
<td>Device Embolization</td>
<td>0.25%</td>
</tr>
<tr>
<td>Procedure-Related Death</td>
<td>0.06%</td>
</tr>
</tbody>
</table>

LARIAT Epicardial Suture
LARIAT US Experience

712 patients unable to take anticoagulation

Procedural success - > 95%

<table>
<thead>
<tr>
<th>Indication for LAA exclusion</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke on anticoagulation</td>
<td>12.6</td>
</tr>
<tr>
<td>Prohibitive bleeding</td>
<td>67.4</td>
</tr>
<tr>
<td>Fall risk preventing AC</td>
<td>11.6</td>
</tr>
<tr>
<td>Noncompliance with AC</td>
<td>0.0</td>
</tr>
<tr>
<td>Other</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Table 6  Findings of follow-up transesophageal echocardiography (n = 480)

<table>
<thead>
<tr>
<th>Procedural variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of leak of 2–5 mm</td>
<td>31 (6.5)</td>
</tr>
<tr>
<td>Evidence of leak of &gt; 5 mm</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Evidence of thrombus of the left atrial appendage</td>
<td>12 (2.5)</td>
</tr>
</tbody>
</table>
Clinical Case

- 73-year-old man – recurrent persistent atrial fibrillation despite PVI x 2 and dofetilide use
- CHA$_2$DS$_2$VASc - 3 (age, stroke)
- Anticoagulation with warfarin – spontaneous psoas muscle bleeding with intramuscular and retroperitoneal hematoma requiring blood transfusions
- For stroke prevention we have used Lariat appendage ligation
Role of LAA in AF

LAA Triggers

Automaticity cells identified in the LAA that leads to AT²

Reentrant Circuits

Heterogeneous fiber orientation and trabeculated muscle
• formation of conduction block/slow conduction
• initiation of reentry

LAA Role in Persistent AF

27% of patients at repeat AF ablation had LAA firing

BELIEF Trial

Promotes stasis and thrombus formation

LAA-LA AF
Hypothesis - LAA ligation produces electrical isolation of the LAA, decreases AF burden and recurrence of AF, thus creating a “closed-chested MAZE” procedure.

Demonstrate LARIAT + PVI will lead to reduced incidence of recurrent AF compared to PVI alone, with a high safety profile.
Conclusions

• Lately LAA has been recognized as a valuable potential therapeutic target for
• Stroke prevention
• Treatment of atrial fibrillation