What's new in arrhythmias and devices

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Disclosures

- I have been a consultant with Medtronic and St. Jude.
- There will be commercial references to Boston Scientific, Medtronic and St. Jude companies during this lecture.
- No company is paying me or sponsoring me to present this lecture... unfortunately.
Atrial Fibrillation

- Two recent studies confirm that paroxysmal atrial fibrillation may be missed using standard cardiac monitoring, such as 24 or 48 hour holter monitoring. Newest recommendations from the CRYSTAL AF trial and the EMBRACE trial recommend ambulatory cardiac monitoring with either external or internal loop recording, for at least 30 days.
- St. Jude Zio patch, Medtronic Linq Reveal
Devices for Monitoring

St. Jude Zio Patch
Devices for Monitoring

Medtronic Linq Reveal
Atrial Fibrillation

- Role of anticoagulation in atrial fibrillation – Coumadin vs. newer anticoagulants, when or if to stop, who not to anticoagulate.

- New guidelines from AHA/ACC/HRS

- Surgery for atrial fibrillation
COUMADIN / WARFARIN

The tried and true, old standby for anticoagulation
The new kids in town
<table>
<thead>
<tr>
<th></th>
<th>Warfarin</th>
<th>Rivaroxaban</th>
<th>Apixaban</th>
<th>Dabigatran etexilate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target</strong></td>
<td>Vitamin K epoxide reductase (reducing the vitamin K dependent coagulation factors)</td>
<td>Factor Xa</td>
<td>Factor Xa</td>
<td>Thrombin</td>
</tr>
<tr>
<td><strong>T (max)</strong></td>
<td>72-96 h</td>
<td>2.5-4 h</td>
<td>3 h</td>
<td>2 h</td>
</tr>
<tr>
<td><strong>Half-life</strong></td>
<td>40 h</td>
<td>5-9 h healthy, 9-13 h elderly</td>
<td>8-15 h</td>
<td>14-17 h</td>
</tr>
<tr>
<td><strong>Monitoring</strong></td>
<td>INR-adjusted</td>
<td>Not needed</td>
<td>Not needed</td>
<td>Not needed</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>Once daily</td>
<td>Once daily</td>
<td>Twice daily</td>
<td>Once or twice daily</td>
</tr>
<tr>
<td><strong>Metabolism</strong></td>
<td>CYP P450</td>
<td>66% fecal, 33% renal</td>
<td>75% fecal, 25% renal</td>
<td>80% renal, 20% fecal</td>
</tr>
<tr>
<td><strong>Drug Interactions</strong></td>
<td>CYP 2C9, 1A2, and 3A4 inhibitors</td>
<td>Potent CYP 3A4 inhibitors</td>
<td>Potent CYP 3A4 inhibitors decrease absorption</td>
<td>Proton pump inhibitors and P-gp inhibitor decrease absorption</td>
</tr>
</tbody>
</table>

**Oral Anticoagulant Comparison**
Atrial Fibrillation
### CHADS2 vs. CHADS2-VASc

<table>
<thead>
<tr>
<th>CHADS2 Risk</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>CHF</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt; 75</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Stroke or TIA</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHADS2-VASc Risk</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF or LVEF ≤ 40%</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Age ≥ 75</td>
<td>2</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Stroke/TIA/Thromboembolism</td>
<td>2</td>
</tr>
<tr>
<td>Vascular Disease</td>
<td>1</td>
</tr>
<tr>
<td>Age 65-74</td>
<td>1</td>
</tr>
<tr>
<td>Female</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Variable</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Hypertension</td>
<td>1 point</td>
</tr>
<tr>
<td>A</td>
<td>Abnormal renal or hepatic function</td>
<td>1–2 points</td>
</tr>
<tr>
<td>S</td>
<td>Prior stroke</td>
<td>1 point</td>
</tr>
<tr>
<td>B</td>
<td>Bleeding</td>
<td>1 point</td>
</tr>
<tr>
<td>L</td>
<td>Labile INR values</td>
<td>1 point</td>
</tr>
<tr>
<td>E</td>
<td>Elderly, i.e., over age 65</td>
<td>1 point</td>
</tr>
</tbody>
</table>
Highlights from January 2014
AHA/ACC/HRS Atrial fibrillation
guidelines
Rhythm Control

Atrial fibrillation

No other CV disease
- Beta blocker
diltiazem
verapamil

HTN or CHF with good EF
- Beta blocker
diltiazem
verapamil

CHF with bad EF
- Beta blocker
digoxin

COPD
- Beta blocker
diltiazem
verapamil

amiodarome
Electrical Cardioversion and anticoagulation

- Patients who can have elective cardioversion, should have 3 weeks of anticoagulation prior to and for 4 weeks after cardioversion.
- If the patient is hemodynamically unstable, anticoagulation should be initiated ASAP and continued for 4 weeks.
- TEE should be performed prior to cardioversion if the patient has not been anticoagulated for 3 weeks and cardioversion is deemed necessary, e.g., Rapid ventricular response atrial fibrillation unresponsive to pharmacologic cardioversion.
Pharmacologic cardioversion recommendations

- Flecainide, dofetilide, propafenone and ibutilide are class I recommended drugs
- Oral amiodarone is an option – class 2a
- Beta blockers are usually not recommended as solo therapy for maintaining sinus rhythm, but are useful in preventing AF after cardiac surgery
- Amiodarone is the most effective drug for maintenance of sinus rhythm for PAF or persistent AF
Catheter Ablation to maintain sinus rhythm

- Useful for patients who have symptomatic paroxysmal atrial fibrillation and who are intolerant to at least 1 antiarrhythmic medication.
- May be useful in patients who have persistent atrial fibrillation and who are intolerant to at least 1 antiarrhythmic medication
- Not recommended for very elderly patients, longstanding persistent AF, significant CHF, those with severe LVH
Surgery to correct atrial fibrillation

- The Maze procedure was introduced in 1987, most common form now is Cox-Maze 3 typically used in conjunction with other cardiac surgeries.
- Not widely performed as many training centers do not teach it, due to surgeons reluctance and complicated techniques.
- Stand alone Cox-Maze has been done but has recurrence rates up to 42% and 58% respectively for paroxysmal and persistent AF.
- Should be performed by experienced centers.
Devices
“simple” pacemakers

**Single chamber**
- One wire in the right ventricle
- Chronic Atrial fibrillation with slow ventricular response, most common

**Dual chamber**
- One wire in the right atrium and one in the right ventricle
- Many different indications
“simple pacemakers”

- Triple chamber or Biventricular pacemaker
- Just like a dual chamber plus one wire guided through the coronary sinus and onto the surface of the left ventricle
- Not as common in the US, more commonly associated with a defibrillator.
Pacemaker/defibrillators

- Again available in single, dual or biventricular (triple) lead varieties
- Becoming more common as we are more successful at treating and surviving CHF with low ejection fractions
What's new?

- MRI compatibility - leads and generators now compatible and safe for MRI, Medtronic and soon to be seen Boston Sci and St. Jude
- Battery duration - close to a decade for “simple” pacemakers and depending on whether a patient is shocked by their ICD… up to maybe 7 years
- Generator sizes and shapes - smaller and more contoured edges to avoid skin erosion.
- Lead Technology is ever changing, most common update in device technology
Generator Sizes and Shapes
This is why you want smaller and more contoured generators
Lead changes
What's next
The future

- Leadless technology
- Smaller generators
- Nanotechnology
The End

Thank you!