Accessory Pathways Ablation

I have no actual or potential conflict of interest in relation to this program or presentation.

Maurice Khoury M.D.
TPES OF AP

- Different types exist: Kent, James, Mahaim

- Difference is the connecting points

- Kent = Atria to ventricle

- James = Atria to node or within nodes

- Mahaim = RA and the right branch (atriofascicular)
AVRT ORTHODROMIC
AVRT ANTIDROMIC
Accessory AV Pathways

- Symptoms: Range from asymptomatic to sudden cardiac death
- Conduction: Antegrade and/or retrograde
- SVT may be frequent or recurrent

Wolff-Parkinson-White EKG Pattern
- Up to 40% of patients remain asymptomatic
- Orthodromic reciprocating tachycardia (30% of PSVTs) clinical presentation:
  - Antegrade conduction over AV node
  - Retrograde conduction over accessory pathway

Wolff-Parkinson-White Syndrome

- If accessory pathway not capable of anterograde conduction, the ECG may not show pre-excitation (concealed pathway)
- The electrocardiogram may show pre-excitation (delta wave)

- If accessory pathway capable of rapid antegrade conduction
  - Increased risk to develop VF from rapid conduction of AF
  - RF ablation associated with high degree of success
Accessory AV Pathways

- Location: Right free-wall
  Septal accessory pathways
  Left free-wall

- Approach: Venous, transseptal or retrograde aortic

- Efficacy: 89-99%
  Highest left-sided pathways
  Lower septal and right-sided pathways

- Recurrence: 3-9%

Goal of Ablation:

Destruction of localized cardiac tissue critical to the initiation or maintenance of an arrhythmia
Types of Energy Sources

- Direct current
- **Radiofrequency**
- Microwave
- Ultrasound
- Laser
- Chemical
- Cryogenic
- Surgical
RADIOFREQUENCY ABLATION

MOST COMMONLY USED TECHNIQUE OVER THE LAST DECADE.

• GREATER EFFICACY; ABILITY TO CONTROL VERY FOCAL AREA OF INJURY.

• GREATER SAFETY; LOW ENERGY FREQUENCIES PREVENT BAROTRAUMA.

• ELECTICAL ENERGY IS CONVERTED TO THERMAL ENERGY.

• MONITORING OF IMPEDENCE AND TISSUE CONTACT TIME IS CRITICAL TO ENSURE ADEQUATE TISSUE CONTACT.

• HEATING MYOCARDIAL TISSUE AT 50 DEGREES CELCIUS RESULTS IN COAGULATION NECROSIS AND COMPLETE DESTRUCTION OF TISSUE.
# Biophysics of RF Ablation

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternating current</td>
<td>300-750 kHz</td>
</tr>
<tr>
<td>Tissue heated with electrode contact</td>
<td>45-100°C</td>
</tr>
<tr>
<td>Lesion diameter</td>
<td>5-6 mm</td>
</tr>
<tr>
<td>Lesion depth</td>
<td>2-3 mm</td>
</tr>
</tbody>
</table>

Schematic Diagram of RF Current Delivery

• Area of the myocardium that is directly affected by the current flow
  • Thermal injury by heat conducted from the zone of resistive heating

Kalbfleish SJ, Langber JJ.
Temperature

• $< 50$ degrees C = transient loss
• $> 50$ degrees C = permanent damage
• $> 80$ degrees C = coagulum
Procedure for RF Ablation

- Conscious sedation
- 3-5 venous catheters/occasional arterial
- RF current delivery via 4-8 mm tipped catheter
- Usually single procedure: diagnostic study and ablation
Bypass Tracts

• Study patterns of ventricular activation during preexcitation and of atrial activation during retrograde conduction
• Identify earliest electrogram from positioned catheters
• Atrial insertion site is sought during ventricular pacing or SVT
• Identify AP potentials (EGMs)
Left-Sided Bypass Tracts

• Accessed by the arterial retrograde approach or the venous transseptal method
• Left-sided and posterior septal tracts are the easiest to localize using the coronary sinus catheter
• Recurrence rate 6%
Right-Sided Bypass Tracts

- Accessed via the venous system
- Right free wall and anterior septal tracts are more difficult to localize
- Anterior septal pathways are usually approached via the ventricular side of the tricuspid annulus
- Posterior septal lesions are approached either by mapping the tricuspid annulus near the os of the coronary sinus or by mapping near the mitral annulus in the region of the septum
### Measurement Results:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>QRS</td>
<td>374 ms</td>
<td>507 ms</td>
</tr>
<tr>
<td>QT/QTCB</td>
<td>106 ms</td>
<td>104 ms</td>
</tr>
<tr>
<td>PR</td>
<td>20 / 27 ms</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>76 ms</td>
<td></td>
</tr>
<tr>
<td>RR/PP</td>
<td>544 ms</td>
<td>540 ms</td>
</tr>
<tr>
<td>P/QRS/T</td>
<td>75 / 40 / 65 degrees</td>
<td></td>
</tr>
<tr>
<td>QTD/QTCBD</td>
<td>20 / 27 ms</td>
<td></td>
</tr>
<tr>
<td>Sokolow</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>NK</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

### ECG Traces

- I
- II
- III
- AUR
- AUL
- AUl
- II

Unconfirmed report.

18. Mar. 2004 09:51:23 AM 25mm/s 10mm/mV ADS 50Hz 0.08 - 40Hz 6_F1_R Automatic V5.21 ME (1)
POST ABLATION

Unconfirmed report.

Measurement Results:
- QRS: 82 ms
- QT/QTcB: 396 / 471 ms
- PR: 158 ms
- P: 96 ms
- RR/PP: 708 / 700 ms
- P/QRS/T: 50 / 25 / 20 degrees
- QTd/QTcBD: 62 / 74 ms
- Sokolow: 1.5 mV
- NK: 11
# Success Rates for RF Ablations

<table>
<thead>
<tr>
<th>Type of Arrhythmia</th>
<th>Success Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPW or SVT (concealed bypass tract)</td>
<td>85-95</td>
</tr>
<tr>
<td>AV Node Reentry</td>
<td>95+</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>95+</td>
</tr>
<tr>
<td>Typical Atrial Flutter</td>
<td>80-90</td>
</tr>
<tr>
<td>Atrial Tachycardia</td>
<td>70-80</td>
</tr>
<tr>
<td>Ventricular Tachycardia (Normal Heart)</td>
<td>90</td>
</tr>
<tr>
<td>Ventricular Tachycardia (Structural Heart Disease)</td>
<td>60</td>
</tr>
</tbody>
</table>

### RF Ablation Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Non-fatal complications:</strong></td>
<td></td>
</tr>
<tr>
<td>Tamponade</td>
<td>0.5</td>
</tr>
<tr>
<td>AV block</td>
<td>0.5</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Femoral artery complications:</strong></td>
<td></td>
</tr>
<tr>
<td>Thrombolic occlusion</td>
<td>0.2</td>
</tr>
<tr>
<td>Hematoma</td>
<td>0.2</td>
</tr>
<tr>
<td>AV fistula</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Ablation Protocol

- Patients are in fasting state.
- Antiarrhythmic medications discontinued for four half lives before the procedure.
- Medazolam used as needed for sedation.
Ablation protocol

- Routine diagnostic catheters are positioned in the right atrium, right ventricle, his bundle position and coronary sinus.
- Ablation catheter: 7 F, 5mm interelectrode spacing, 4 mm tip with temperature monitoring.
- Heparin during and 12 hrs post procedure.
- Echo. Pre and post ablation.
- Aspirin for one month.
Follow Up

• Two weeks.
• Six weeks. (88% of recurrence).
• 3 months.
• 6 months.
• One year.
RF Ablation: Conclusion

• Advantages of RF ablation
  – Relief of symptoms
  – Improvement in functional capacity and QOL
  – Eliminate need for life-long AA meds
  – Long-term cost savings

• Disadvantage – risk of complications
RF Ablation of Arrhythmias: Conclusion

- RF ablation has revolutionized treatment of most tachyarrhythmias
- Patients can now have complete cure of most organized tachycardias
THANK YOU