Surgical Ablation of Atrial Fibrillation Over Two Decades: Are Results of New Techniques Equivalent to the Cox-maze III Procedure?

Stulak JM, Suri RM, Burkhart HM, Daly RC, Dearani JA, Greason KL, Joyce LD, Park SJ, Schaff HV

Division of Cardiovascular Surgery
Mayo Clinic, Rochester

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Disclosure

Mayo Clinic Division of Cardiovascular Surgery

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No personal equity, patents, licensing, or consulting agreements with the medical device or pharmaceutical industry to disclose.
Background

- Significant evolution in surgical ablation for AF
- Intended to simplify the Cox-maze III operation and maintain similar outcomes
- Alternate energy sources, modified lesion sets, and varied approaches
Practice Trends

Alternative

CSM
January 1993 – January 2011

Total
n = 1,189

Biatrial
n = 810

- CS, n = 514
- RF, n = 56
- Cryo, n = 144
- Combo, n = 96

PVI
n = 269

- CS, n = 2
- RF, n = 181
- Cryo, n = 67
- Combo, n = 19

LA Maze
n = 110

- CS, n = 5
- RF, n = 25
- Cryo, n = 55
- Combo, n = 25
## Preoperative Characteristics

<table>
<thead>
<tr>
<th></th>
<th>CSM</th>
<th>PVI</th>
<th>LA</th>
<th>BA-A</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>62</td>
<td>68</td>
<td>68</td>
<td>68</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>PAF</td>
<td>33%</td>
<td>81%</td>
<td>75%</td>
<td>43%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>DM</td>
<td>8%</td>
<td>13%</td>
<td>10%</td>
<td>14%</td>
<td>0.03</td>
</tr>
<tr>
<td>HTN</td>
<td>52%</td>
<td>69%</td>
<td>59%</td>
<td>61%</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
## Operative Characteristics

<table>
<thead>
<tr>
<th></th>
<th>CSM</th>
<th>PVI</th>
<th>LA</th>
<th>BA-A</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV surg</td>
<td>60%</td>
<td><strong>39%</strong></td>
<td>87%</td>
<td>69%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>XC</td>
<td>59</td>
<td>65</td>
<td>81</td>
<td>85</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>CPB</td>
<td>103</td>
<td>90</td>
<td>109</td>
<td>119</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>LAA lig.</td>
<td><strong>100%</strong></td>
<td>70%</td>
<td>80%</td>
<td>74%</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
## Early Non-fatal Morbidity

<table>
<thead>
<tr>
<th></th>
<th>CSM</th>
<th>PVI</th>
<th>LA</th>
<th>BA-A</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bleeding</strong></td>
<td>6%</td>
<td>3%</td>
<td>1%</td>
<td>5%</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Stroke</strong></td>
<td>1%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
<td>0.66</td>
</tr>
<tr>
<td><strong>RF</strong></td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>5%</td>
<td>0.13</td>
</tr>
<tr>
<td><strong>PPM</strong></td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>7%</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Follow-up

CSM 18.5 yr → 57 mos.
PVI 8 yr → 30 mos.
LA 10.2 yr → 26 mos.
BA-A 9.5 yr → 26 mos.
Multivariate Logistic Regression

- < 1 year
  - Age (per 5 years) (H.R.: 1.44 [1.2, 1.7])

- 1 – 5 years
  - Preop PAF (H.R.: 0.33 [0.2, 0.5])
  - Cox-maze III (H.R.: 0.4 [0.2, 0.7])
  - MV surgery (H.R.: 0.6 [0.4, 0.96])
  - Age (per 5 years) (H.R.: 1.1 [1, 1.2])

- > 5 years
  - Cox-maze III (H.R.: 0.23 [0.12, 0.42])
  - Preop PAF (H.R.: 0.36 [0.2, 0.66])
  - NYHA III/IV (H.R.: 1.84 [10.4, 3.27])
Summary and Conclusions

- Heterogeneity confers challenges in evaluating outcomes

- While new technology offers multiple benefits, transmural lesions assured with Cox-maze III procedure

- Cox-maze III procedure appears to remain gold standard for surgical AF ablation
Thank You!