Postoperative Management of Patients Following Surgical Ablation

Harold G. Roberts, Jr.

Department of Cardiovascular and Thoracic Surgery
West Virginia University
Morgantown, WV
Postop Management

Points to Remember:

• Blood conservation
• Early extubation
• Management of antiarrhythmic drugs
• Management of oral anticoagulation
The Impact of Blood Conservation on Outcomes in Cardiac Surgery: Is It Safe and Effective?

David M. Moskowitz, MD, Jock N. McCullough, MD, Aryeh Shander, MD, James J. Klein, MD, Carol A. Bodian, DrPH, Richard S. Goldweit, MD, and M. Arisan Ergin, MD

Table 7. Percentage of Patients with Very Serious Complications or Serious Complication Associated With Use of Blood Products

<table>
<thead>
<tr>
<th>Variable</th>
<th>EH</th>
<th>OH-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood products used</td>
<td>24/62 (38.7%)</td>
<td>80/249 (32.1%)</td>
</tr>
<tr>
<td>Blood products not used</td>
<td>41/524 (7.8%)</td>
<td>28/337 (8.3%)</td>
</tr>
</tbody>
</table>

*A statistically significant association between transfusion and increased rate of complications was found in both cohorts. p < 0.0001 for each cohort.

EH = Englewood Hospital; OH-M = propensity-matched patients at other hospitals.
Prescriptive Oxygenator

Net prime volume of 125-175 ml

Conventional oxygenator

Pediatric oxygenator
Useful Adjuncts to Minimize Prime

- Dry 3/8 inch venous tubing
- Retrograde autologous priming (RAP)
- Quest blood microplegia: 1/10 volume of crystalloid compared to conventional 4:1 blood cardioplegia
- Circuit kept short as practical

<table>
<thead>
<tr>
<th></th>
<th>BSA (m²)</th>
<th>Prime volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult Oxygenator</td>
<td>≥ 2</td>
<td>250 ml</td>
</tr>
<tr>
<td>Pediatric Oxygenator</td>
<td>&lt; 2</td>
<td>100 ml</td>
</tr>
</tbody>
</table>
Blood Transfusion Rate at WVU (HGR)

For Isolated Elective CABG:

- 20%
Extubating in the operating room after adult cardiac surgery safely improves outcomes and lowers costs

Vinay Badhwar, MD, Stephen Esper, MD, Maria Brooks, PhD, Suresh Mulukutla, MD, Regina Hardison, MS, Demetri Mallios, BS, Danny Chu, MD, Lawrence Wei, MD, and Kathirvel Subramaniam, MD

**Early extubation criteria:**

- Normothermia
- Stable hemodynamics
- The absence of mediastinal bleeding
- Adequate muscle strength and respiratory effort (TV > 5 ml/kg)
- Fully awake, capable of following commands

Extubating in the operating room after adult cardiac surgery safely improves outcomes and lowers costs

Vinay Badhwar, MD, Stephen Esper, MD, Maria Brooks, PhD, Suresh Mulukutla, MD, Regina Hardison, MS, Demetri Mallios, BS, Danny Chu, MD, Lawrence Wei, MD, and Kathirvel Subramaniam, MD

**Clinical Outcomes in Propensity Matched Pairs**

<table>
<thead>
<tr>
<th></th>
<th>Any Complications</th>
<th>Direct Home Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extubation in OR</td>
<td>27.4%</td>
<td>88.7%</td>
</tr>
<tr>
<td>Extubation ≤12 hours</td>
<td>38.7%</td>
<td>72.8%</td>
</tr>
</tbody>
</table>

**Length of Stay Outcomes in Propensity Matched Pairs**

- ICU Stay (hours): Mean 26.3, Median 26.0
- Operation to Discharge (days): Mean 5, Median 6

*p-values: 0.096, <0.001, 0.0013, 0.0001, 0.0008*
Predictors of operating room extubation in adult cardiac surgery

Kathirvel Subramaniam, MD, MPH, a Diana S. DeAndrade, MD, a Daniel R. Mandell, MD, a Andrew D. Althouse, PhD, b Rajan Manmohan, BS, c Stephen A. Esper, MD, MBA, a Jeffrey M. Varga, MD, a and Vinay Badhwar, MD d

Factors associated with successful OR extubation:

• Younger age
• Lower body mass index
• Higher preoperative serum albumin
• Absence of COPD and DM
• Less invasive surgical approach
• Isolated CABG
• Elective surgery
• Lower doses of intraoperative IV fentanyl

Post Management of Antiarrhythmic Drugs

- Intraoperative amiodarone loading
  - 1mg/min upon CPB until 6 hrs postop, then 0.5mg/min until POD 1
- Amiodarone 400 mg po bid (POD 0)
- Tapered over 3 months
  - 400 mg BID x 1 m, 200 mg BID x 1 m, 200 QD x 1 m
- In case of amiodarone intolerance: sotalol, dofetilide, or propafenone
Management of Post Ablation AF

- Adequate loading with amiodarone
- Diuresis - avoid hypokalemia/hypomagnesemia
- “AF begets AF”
- Electrical cardioversion after 24 hours if chemical cardioversion unsuccessful
- No patient discharged in AF
Other Important Aspects of Postop Management

- Aggressive pulmonary toilet
- Early ambulation
- Early removal of invasive lines
- Diuresis, generally POD 2
- Avoid hypokalemia/hypomagnesemia
Anticoagulation following Surgical Ablation

• If patient has received successful surgical ablation with secure LAA obliteration, what is the need and duration of OAC (oral anticoagulation)?

• Post-SA OAC is classic risk vs benefit.

• When is it safe to discontinue OAC after surgical ablation?
A More Specific Anticoagulation Regimen Is Required for Patients After the Cox-Maze Procedure

Niv Ad, MD, Linda Henry, PhD, RN, Deborah J. Shuman, BS, and Sari D. Holmes, PhD

At 6 months, the patient undergoes 7 days of Holter monitoring with no AADs, and it is determined whether the patient is in sinus rhythm according to HRS guidelines (ie, no atrial arrhythmia episode lasting > 30 seconds). Echocardiography is used to confirm no stasis in the left atrium and a well-managed LAA. If all these criteria are met, a recommendation is made to the presiding cardiologist to discontinue OAC therapy.
The impact of CHADS$_2$ score on late stroke after the Cox maze procedure

Mitchell Pet, MD, Jason O. Robertson, MD, MS, Marci Bailey, RN, MSN, Tracey J. Guthrie, RN, BSN, Marc R. Moon, MD, Jennifer S. Lawton, MD, Andrew Rinne, MD, Ralph J. Damiano, Jr, MD, and Hersh S. Maniar, MD

Postoperatively, all patients were anticoagulated with warfarin for 3 months unless contraindicated. After 3 months, warfarin therapy was discontinued for patients who were off all antiarrhythmic drugs and in normal sinus rhythm, as determined by electrocardiography (1987-2002) or 24-hour Holter monitoring (2002-2008).
A randomized, prospective pilot comparison of 3 atrial appendage elimination techniques: Internal ligation, stapled excision, and surgical excision

Richard Lee, MD, MBA, Patricia Vassallo, MD, Jane Kruse, BS, RN, S. Chris Malaisrie, MD, Vera Rigolin, MD, Adin-Cristian Andrei, PhD, and Patrick McCarthy, MD

TABLE 3. Late evaluation of LAA elimination

<table>
<thead>
<tr>
<th>Variable</th>
<th>Internal ligation (n = 7)</th>
<th>Stapled excision (n = 8)</th>
<th>Surgical excision (n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual stump &gt;1 cm present, n (%) [95% CI]</td>
<td>1 (14) [0.004-0.579]</td>
<td>2 (25) [0.032-0.651]</td>
<td>3 (50) [0.118-0.881]</td>
</tr>
<tr>
<td>Gap present, n (%) [95% CI]</td>
<td>3 (43) [0.099-0.816]</td>
<td>0 (0) [0-0.369]</td>
<td>0 (0) [0-0.45]</td>
</tr>
<tr>
<td>Flow, n (%) [95% CI]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than mild flow</td>
<td>3 (43) [0.099-0.816]</td>
<td>0 (0) [0-0.369]</td>
<td>0 (0) [0-0.459]</td>
</tr>
<tr>
<td>No flow</td>
<td>4 (57) [0.184-0.901]</td>
<td>8 (100) [0.631-1]</td>
<td>6 (100) [0.540-1]</td>
</tr>
</tbody>
</table>

CI, Confidence interval.
Success of Surgical Left Atrial Appendage Closure

Assessment by Transesophageal Echocardiography

Anne S. Kanderian, MD,* A. Marc Gillinov, MD,† Gosta B. Pettersson, MD, PhD,† Eugene Blackstone, MD,† Allan L. Klein, MD, FACC*

Cleveland, Ohio

Table 2  Success of Different Techniques of LAA Closure

<table>
<thead>
<tr>
<th>Type of Closure</th>
<th>n</th>
<th>Patent LAA</th>
<th>Remnant LAA</th>
<th>Excluded LAA With Persistent Flow</th>
<th>Successful LAA Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excision</td>
<td>52</td>
<td>0</td>
<td>14 (27%)</td>
<td>0</td>
<td>38 (73%)*</td>
</tr>
<tr>
<td>Suture exclusion, n (%)</td>
<td>73</td>
<td>6 (8)</td>
<td>6 (8)</td>
<td>44 (61)</td>
<td>17 (23)*</td>
</tr>
<tr>
<td>Stapler exclusion, n (%)</td>
<td>12</td>
<td>2 (17)</td>
<td>7 (58)</td>
<td>3 (25)</td>
<td>0 (%)†</td>
</tr>
<tr>
<td>Total, n (%)</td>
<td>137</td>
<td>8 (6)</td>
<td>27 (20)</td>
<td>47 (34)</td>
<td>55 (40)</td>
</tr>
</tbody>
</table>
Plication LA Appendage

Suture Line
Knowledge and Evidence Gap

- Safety of the Maze Operation with very low stroke rates established by Cox.

- No clear evidence based guideline recommendations other than it may be reasonable to anticoagulate for 1 to 6 months.
2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation: executive summary

- All current anticoagulation recommendations are based on data derived from catheter based experience
- “Currently there is no evaluable evidence to define practice of anticoagulation following surgical ablation”
Oral Anticoagulation May Not Be Necessary for Patients Discharged in Sinus Rhythm Following the Cox Maze IV Procedure

Takashi Murashita MD, J. Scott Rankin MD, Lawrence M. Wei MD, Harold G. Roberts MD, Mohamad A. Alkhouli MD, and Vinay Badhwar MD

AATS Centennial
1917-2017

Reflecting on the Past.
Building our Future.
Always Learning.

American Association for Thoracic Surgery
A Century of Modeling Excellence

J Thorac Cardiovasc Surg 2017 (in press)
Methods

October 2011 to April 2016
Biatrial Cox-Maze IV for *persistent* AF
(n=239)

Exclusions (n=57)
Mechanical prostheses, venous thrombotic disease,
low LVEF < 20%, atrial calcification or thrombus,
concomitant tricuspid replacement, or known
hypercoagulable state.

Patients discharged in NSR
with aspirin only
(n=176)
Postoperative Anticoagulation

Aspirin only unless for the following 6 specific OAC indications:

– mechanical prostheses
– venous thrombotic disease
– LVEF < 20%
– atrial calcification or thrombus
– hypercoagulable state
– concomitant tricuspid replacement (6 months)
### RESULTS

#### 6-month Follow-up Outcomes

<table>
<thead>
<tr>
<th></th>
<th>No OAC (n = 176)</th>
<th>OAC (n = 57)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative CHADS$_2$Vasc</td>
<td>2 [2-3]</td>
<td>2 [2-3]</td>
<td>0.914</td>
</tr>
<tr>
<td>Stroke</td>
<td>1 (0.6)</td>
<td>0</td>
<td>&gt;0.999</td>
</tr>
<tr>
<td>Major bleeding events</td>
<td>4 (2)</td>
<td>3 (5)</td>
<td>0.366</td>
</tr>
<tr>
<td>Any AF recurrence</td>
<td>22 (13)</td>
<td>8 (14)</td>
<td>0.764</td>
</tr>
<tr>
<td>OAC restarted</td>
<td>12 (7)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>OAC discontinued</td>
<td>—</td>
<td>20 (35)</td>
<td>—</td>
</tr>
</tbody>
</table>
Cumulative Freedom From Stroke Discharged Off OAC

4-year freedom from stroke: 97.5% (< 1% per year)
Conclusions

• Blood conservation and early extubation are useful adjuncts in avoiding surgical morbidity.
• Routine loading with amiodarone and early electrical cardioversion improve mid-term results.
• No clear surgical evidence to support routine anticoagulation post SA or timing of discontinuation.
• With secure closure of LAA, selective anticoagulation post-ablation appears safe. Prospective trials are sorely needed to fill this important knowledge gap.