Catheter Ablation of Valvular Atrial Fibrillation

Rong Bai, MD, FESC, FHRS

Beijing Anzhen Hospital, Capital Medical University
Beijing, China
NO CONFLICT OF INTEREST TO DECLARE
How to define valvular atrial fibrillation?

- **2014 AHA/ACC/HRS Atrial Fibrillation Guidelines**
  - **Nonvalvular AF**: AF in the absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve, or mitral valve repair.

- **2012 ESC Atrial Fibrillation Guidelines**
  - No satisfactory or uniform definition of these terms exists.
  - **Valvular AF**: AF related to rheumatic valvular disease (predominantly mitral stenosis), or prosthetic heart valves.

J Am Coll Cardiol. 2014; 64: e1-76
Eur Heart J. 2012; 33: 2719-47
Valvular heart disease & Atrial fibrillation

- Valvular heart disease has been associated with a 1.8- and 3.4-fold increased risk for AF in men and women

- Valvular heart disease
  - increase LA pressure
  - cause atrial myopathy
  - alter wall stress

  - increase susceptibility to AF

- AF is the most common arrhythmia following surgery for valvular heart disease

References:
- JAMA. 2004; 291(14):1720-9
- Circ Res. 2014; 114(9): 1453-68
- J Am Coll Cardiol. 2014; 64: e1-76
Valvular atrial fibrillation & Thromboembolic risk

- Valvular heart disease, independent of the underlying cardiac rhythm, is associated with an increased risk of thromboembolic events.
- This risk is greatly amplified in the presence of AF.

Valvular AF

- AF accompanying moderate-to-severe mitral stenosis and mechanical prosthetic valves: particularly high risk of thromboembolism
- AF with mitral regurgitation, aortic stenosis or insufficiency: do not increase the risk of thromboembolism
- AF in the presence of a bioprosthetic heart valve or after valve repair: same risk of thromboembolism as with native valve

Eur Heart J. 2014; 35(47): 3328-35
Management of valvular atrial fibrillation

- **Rate control**
  - Pharmacological agents for rate control

- **Rhythm control**
  - Antiarrhythmic drugs
  - Catheter ablation
  - Surgical ablation
Catheter Ablation in AF Patients with Valvular Heart Disease

Higher recurrence?
AF ablation in patients with valvular heart disease or prior open heart surgery

102 pts with valve disease, 40 pts with prior open-heart surgery, 194 pts as control

- pulmonary vein antrum isolation + superior vena cava isolation

Table 3: Complications and recurrences, n (%)

<table>
<thead>
<tr>
<th></th>
<th>Lone AF n = 194</th>
<th>Valve disease n = 102</th>
<th>CVSx n = 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVA</td>
<td>0</td>
<td>1 (1)</td>
<td>0</td>
</tr>
<tr>
<td>TIA</td>
<td>1 (0.5)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tamponade</td>
<td>4 (2)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Access site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hematoma</td>
<td>1 (0.5)</td>
<td>1 (1)</td>
<td>0</td>
</tr>
<tr>
<td>Severe PV stenosis</td>
<td>2 (1)</td>
<td>1 (1)</td>
<td>0</td>
</tr>
<tr>
<td>Combined adverse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outcomes</td>
<td>8 (4)</td>
<td>3 (3)</td>
<td>0</td>
</tr>
<tr>
<td>Recurrence</td>
<td>31 (16)</td>
<td>17 (17)</td>
<td>6 (15)</td>
</tr>
<tr>
<td>Controlled on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>antiarrhythmic drug</td>
<td>4 (2)</td>
<td>5 (5)</td>
<td>3 (8)</td>
</tr>
<tr>
<td>2nd PVI</td>
<td>27 (14)</td>
<td>12 (12)</td>
<td>3 (8)</td>
</tr>
<tr>
<td>On antiarrhythmic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>drug post 2nd PVI</td>
<td>0</td>
<td>2 (2)</td>
<td>0</td>
</tr>
<tr>
<td>Follow-up, mo</td>
<td>18 ± 7</td>
<td>11 ± 5</td>
<td>10 ± 5</td>
</tr>
</tbody>
</table>

Catheter ablation of persistent AF in patients with valvular heart diseases

- Group I (51 pts with VHD), Group II (60 pts without VHD as control)
- Circumferential pulmonary vein isolation (CPVI) + complex fractionated atrial electrogram (CFAE) ablation
- FU: 12months

Heart. 2009; 95(21): 1773-83
No statistically significant difference in AF-free survival between the two groups
Successful outcomes related to left atrium diameter (LAD)

Group I

Group II

Heart. 2009; 95(21): 1773-83
Catheter ablation of atrial Fibrillation in patients with valvular heart disease

- Group 1 (45 pts with moderate VHD), Group 2 (436 pts without VHD as control)
- Excluded: history of valve surgery or other structural heart disease
- Pulmonary vein antrum isolation + LA linear ablation (persistent AF)
- FU: 26 months

J Cardiovasc Electrophysiol. 2010; 21(11): 1193-8
Catheter Ablation in AF Patients With Mitral Mechanical Prosthetic Valve

Risk of prosthetic valvular damage and entrapment of the ablation catheter?
Ablation of AF in patients with MVP is feasible

- 26 pts with mitral valve prostheses (MVP), 52 pts without MVP as control
- circumferential pulmonary vein ablation + mitral isthmus line (81%) + posterior left atrial line
- FU: 12 months

J Am Coll Cardiol. 2005; 45(6): 868-72
Higher complications
Greater radiation exposure
Higher incidence of post-ablation atrial tachycardia
RF ablation for AF patients with prosthetic valves is feasible, safe, and efficacious
- longer procedural and fluoroscopy times
- higher recurrence rates for atrial flutter
Radiofrequency ablation of AF is feasible and safe for patients with MVR

- 81 pts with mitral valve replacement (MVR), 162 pts without MVR as control
- pulmonary vein antral isolation
- 1.4±0.6 vs. 1.2±0.5 ablations per person in patients with and without MVR
- FU: 24 months

J Am Coll Cardiol. 2011; 58(6): 596-602
Table 4

<table>
<thead>
<tr>
<th>Parameter</th>
<th>No MVR (n = 182)</th>
<th>MVR (n = 81)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor complications, %</td>
<td></td>
<td></td>
<td>0.20</td>
</tr>
<tr>
<td>Pericardial effusion, no intervention</td>
<td>1.2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Major complications, %</td>
<td></td>
<td></td>
<td>0.52</td>
</tr>
<tr>
<td>Bleeding requiring transfusion</td>
<td>0.6</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Hematoma requiring intervention</td>
<td>1.2</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Femoral pseudoaneurysm</td>
<td>0</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Tamponade</td>
<td>0.6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Native or prosthetic valve damage</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

- Similar incidence of procedure related complications
Catheter Ablation of Atrial Fibrillation in Patients with Mechanical Mitral Valve: PVAI w/wo non-PV Trigger ablation

AF patients with MMV (N=109)
Paroxysmal AF N=39; Persistent AF N=70

PVAI (N=45)

PVAI + Non-PV trigger ablation (N=64)

12-month follow-up after the 1st procedure

Arrhythmia Recurrence within 12-month (N=38)
AF: 24; AFL: 16; AT: 2

SR off AAD (N=7)

2nd procedure

2nd procedure

Arrhythmia Recurrence after 12-month (N=4)
AF: 1; AT: 3

Arrhythmia Recurrence after 12-month (N=12)
AFL: 3; AT: 9

Follow-up at 36±7 months after single procedure

SR off AAD (N=3)

SR off AAD (N=27)

AF: atrial fibrillation; AFL: atrial flutter; AT: atrial tachycardia; MMV: mechanical mitral valve; PVAI: pulmonary vein antrum isolation; SR: sinus rhythm; AAD: anti-arrhythmic drug

J Cardiovasc Electrophysiol; 2014; 25(8): 824-33
Origin of non-PV triggers: CS 53.1%, LAA 62.5%, MV annulus 18.7%, LA roof/free wall 14.1%, interatrial septum 32.8%, and SVC or crista terminalis 19.8%
Catheter Ablation of Atrial Fibrillation in Patients with Mechanical Mitral Valve: PVAI w/wo non-PV Trigger ablation
Catheter ablation of mitral annular flutter is feasible and safe in patients with prior MV replacement or repair

- 21 pts with a history of MV surgery, 21 pts as control
- mitral isthmus line ablation
- FU: 6 months
Reviews: Advances in catheter ablation in AF patients with mitral mechanical prosthetic valve

![Graph showing mean procedural time (min) for MVR and Controls. The graph compares different studies: Lang et al., Lakkireddy et al., and Hussein et al., with the overall average. The y-axis represents different studies, and the x-axis represents time in minutes. The control group shows a mean procedural time of 130.1 minutes, while the MVR group shows a time of 150.8 minutes. The difference is statistically significant (P = 0.001).]
Reviews: Advances in catheter ablation in AF patients with mitral mechanical prosthetic valve
Reviews: Advances in catheter ablation in AF patients with mitral mechanical prosthetic valve
Comparison of Catheter Ablation and Surgical Ablation in Patients with AF and VHD

Which is better?
Catheter ablation vs. Surgical CryoMaze procedure in patients with long-lasting persistent AF and RHD

- patients with RHD and persistent AF pre-existing for more than 1 year
- Group A (valvular operation and CPVI combined with substrate modification 6 months after the surgery), Group B (valvular operation and concomitant Maze procedure with SICTRA)
- Circumferential pulmonary vein isolation + complex fractionated atrial electrograms ablation
- FU: 12months

Eur Heart J. 2010; 31(21): 2633-41
The concomitant Cox Maze procedure using SICTRA is more effective than subsequent CPVI combined with substrate modification.

Eur Heart J. 2010; 31(21): 2633-41
Single procedure success seems to be higher with SICTRA after a single procedure.

**FU: 48 months**

Int J Cardiol. 2013; 168(6): 5372-7
Repeated catheter ablation potentially results in comparable outcomes in treating patients with LS-AF and RHD during 48 months follow-up

P = 0.566

P = 0.03

after the last procedure

Group A

Group B
Conclusions

- Increased atrial size and pressure, surgical scarring and fibrosis, in addition to probable atrial myopathy from long-standing valvular disease potentially underlie arrhythmia recurrences following catheter ablation of valvular AF.
- AF ablation in patients with prosthetic valve is feasible and safe.
- Catheter ablation of valvular AF could achieve similar outcome to that of non-valvular AF; however, multiple procedures, atrial substrate modification on top of PVAI, longer procedure time and more X-ray exposure may be required.