Hypertrophic Cardiomyopathy and Atrial Fibrillation

AATS: Surgical Treatment of Arrhythmias

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HCM: Focus on the plumbing

- HCM is characterized by left ventricular hypertrophy (LVH) of various morphologies, with a wide array of clinical manifestations and hemodynamic abnormalities:
  - LV outflow obstruction
  - Diastolic dysfunction
  - Myocardial ischemia
  - Mitral regurgitation
  - Embolic risk
Prevalence of HCM and Less Common Diseases Known to Cause Death and Disability

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prevalence</th>
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<tbody>
<tr>
<td>Hypertrophic Cardiomyopathy (HCM)</td>
<td>1: 500</td>
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<tr>
<td>Multiple Sclerosis (MS)</td>
<td>1: 700</td>
</tr>
<tr>
<td>Marfan Syndrome</td>
<td>1: 5,000</td>
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<tr>
<td>Long QT Syndrome (LQTS)</td>
<td>1: 5,000</td>
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<tr>
<td>Cystic Fibrosis (CF)</td>
<td>1: 10,000</td>
</tr>
<tr>
<td>ALS</td>
<td>1: 10,000</td>
</tr>
<tr>
<td>Muscular Dystrophy (MD)</td>
<td>1: 16,000</td>
</tr>
</tbody>
</table>
What we thought 20 years ago

• Estimated to effect 1 in 500 - probably more common
• Focused on hypertrophy-2 morphologies
• HCM, HOCM, hOCM, OCM
• Less than 25 % HCM have HOCM- over 75% have obstruction
• Survival with HCM is similar to age matched controls
• Survival with HOCM is substantially worse
• MV anomalies are uncommon <5%- in fact if look they are very common
Straight vs. Sigmoid Septum
HCM: Atrial fibrillation
A more common arrhythmia

The prevalence of AF appears to be:

• 4-6 folds higher than similarly aged patients in the general population
• Incidence in the range of 2 %/year
• AF is paroxysmal in 2/3 of patients and persistent or permanent in the remaining 1/3
HCM: Atrial fibrillation
A more common arrhythmia

• Generally thought to occur over a lifetime in 25% of the HCM patients

• Recent paper from the Mayo Clinic- within 5 years of undergoing a myectomy, 30% of patients developed atrial fibrillation.
HCM: Atrial fibrillation
Impact on symptoms

• Hypotension, lightheadedness, presyncope, and syncope
  • Afib provokes or worsens LVOT gradients and mitral regurgitation
  • 90% of HCM patients who develop Afib report symptoms
  • Restoration of NSR results in resolution of symptoms

J Am Coll Cardiol 1990; 15:1279
HCM: Atrial fibrillation
Predisposing associations

Overall $p<0.0001$

% of Patients with AF

LA (mm)

$\geq 50$

45-49

40-44

<40

Follow-up after HCM diagnosis (years)
HCM: Atrial fibrillation
Predisposing associations

Overall $p<0.0001$

Circulation 2001; 104:2517
HCM: Atrial fibrillation
Impact on prognosis

• Increase in risk of thromboembolic stroke
  • 480 patients, 22% of whom had paroxysmal or chronic AF
  • Stroke: odds ratio 17.7
  • Development of heart failure: odds ratio 2.8

• Less evidence linking AF to increasing heart failure-related death

HCM: Atrial fibrillation
Impact on Survival

Figure 3. Impact of AF on overall HCM-related mortality. Cumulative survival of 107 patients with HCM and AF is compared with 133 matched HCM patients in sinus rhythm (SR).
HCM: Atrial fibrillation
Impact on prognosis in patients undergoing myectomy

Kaplan–Meier curve demonstrating the composite outcomes of patients with and without residual postoperative atrial fibrillation (AF).

HCM: Atrial fibrillation
Impact on prognosis in patients undergoing myectomy

Stepwise Multivariable Cox Proportional Hazards Analysis for the Composite End Point

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratio</th>
<th>P Value</th>
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<tbody>
<tr>
<td>Age (10-y increment)</td>
<td>1.49 (1.22–1.82)</td>
<td>0.001</td>
</tr>
<tr>
<td>Residual postoperative AF</td>
<td>2.12 (1.37–3.34)</td>
<td>0.001</td>
</tr>
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Obstructive CAD, permanent pacemaker, and concomitant cardiac surgeries did not remain significant in stepwise multivariable analysis. Because of the significant interaction between preoperative and postoperative residual AF, only residual AF was entered in the stepwise multivariable model. $\chi^2$ for the final model 25, $P<0.001$. AF indicates atrial fibrillation; and CAD, coronary artery disease.
Perspective on Surgical Treatment for Atrial Fibrillation at the Cleveland Clinic: 1531 Myectomies

- 9% underwent a atrial fib procedure
- 42% PVI
- 30% Cox Maze III
- 27% Cryo- Cox -Maze IV
- 100% LAA excision or clipping
Atrial Fibrillation Intervention: Cleveland Clinic
Atrial Fibrillation Intervention Sequence

- Non-Pharmacological Therapy (N=147)
- Catheter Ablation (N=79)
  - Atrial Fibrillation Free (N=23)
    - 19 off AADs
  - Recurrent AF (N=48)
    - Paroxysmal 30, Persistent 18
    - Failed AF ablation (N=19)
    - Catheter: Concomitant ablation LA AFL (n=9), CTI AFL (n=8), AT (n=6)
  - 2nd AF Ablation (N=29)
    - 2 AF surgery
    - Failed ablation (N=1)
  - Arhythmic Free (N=5)
    - 4 off AADs
  - Recurrent AF (N=23)
    - Failed ablation (N=1)
  - Recurrent AT (N=1)
  - Failed ablation (N=14)
  - Failed ablation (N=1)
  - Failed ablation (N=1)
  - Failed ablation (N=1)
  - Failed ablation (N=1)
- Recurrent AT (N=1)
- AT ablation (N=2)
- Failed ablation (N=8)

- 3rd AF Ablation (N=10)
  - 2 AF surgery
  - Failed ablation (N=3)
  - Failed ablation (N=7)

- 3rd AF catheter Ablation (N=2)
  - Failed ablation (N=2)
  - Failed ablation (N=2)

- Failed ablation (N=2)

- 2nd AF catheter Ablation (N=7)
  - Failed ablation (N=7)

- Failed ablation (N=8)

- Failed ablation (N=1)
  - Off AADs
Concomitant ablation for atrial fibrillation during septal myectomy in patients with hypertrophic obstructive cardiomyopathy

Alexander V. Bogachev-Prokophiev, MD, Alexander V. Afanasyev, MD, Sergei I. Zheleznev, MD, Alexei N. Pivkin, MD, Michael S. Fomenko, MD, Ravil M. Sharifulin, MD, and Alexander M. Karaskov, MD

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Cox-Maze IV with 8-10 applications of the RF clamp.
Freedom from Atrial Fibrillation at 24 months
HCM and Atrial Fibrillation

• Challenging to treat.

• No large studies.

• Be more than less aggressive.