Current Challenges in Management of Aortic Stenosis

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No Relationships to Disclose
Aortic Stenosis

By John Ross, Jr., M.D. and Eugene Braunwald, M.D.

The advent of corrective operations for aortic stenosis has placed increasing emphasis on more accurate information about the natural history of patients with these lesions. An understanding of the natural history of aortic stenosis has particular importance in the management of patients with aortic stenosis and in the evaluation of sudden death in elderly patients and their potential to accompany them.

From the Cardiology Institute, Bethesda, Maryland

Supplement V to Circulation

Natural History of Aortic Stenosis

Latent Period

Increasing obstruction, myocardial overload

Symptoms

Average Age Death

Survival (percent)

Age (years)

from Ross and Braunwald, Circulation 1968;38:V-61
Evaluation of Patients With Severe Symptomatic Aortic Stenosis Who Do Not Undergo Aortic Valve Replacement
The Potential Role of Subjectively Overestimated Operative Risk

David S. Bach, MD; Derrick Siao, MD; Steven E. Girard, MD, PhD; Claire Duvernoy, MD; Benjamin S. Bush, MD; Scott D. Aronson, MD; A. Carsten Marthinsen, MD; E. Nils Søvik, MD

Aortic Stenosis
Survival of Symptomatic Patients

Bach et al, Circ Cardiovasc Qual Outcomes 2009;2:533-539
Indications for AVR

- Symptomatic patients with severe AS

...if it is likely that the symptoms are cardiac in origin
Aortic Stenosis

Management challenges:

- The asymptomatic patient with severe AS
- Low-flow, low gradient severe AS
- Indications for TAVR
Severe AS:
- Vmax: >4.0 m/s
- Mean Δ: >40 mmHg
- AVA: <1.0 sq cm
Natural History of Severe Asymptomatic AS

Vmax > 4.0 m/s

Pellikka et al. *Circulation* 2005;111:3290-3295
Stewart et al. *Eur Heart J* 2010;31:2216-2222
Nistri et al. *Am J Cardiol* 2012;109:718-723
Natural History of Severe Asymptomatic AS

Natural History of Severe Asymptomatic AS

- **Average hospital mortality:** 8.8%
  - Low volume centers: 13.0%
  - High volume centers: 6.0%

Medicare data

![Graph showing event-free survival over time with three categories of Vmax: 4.0–5.0 m/s, 5.0–5.5 m/s, and >5.5 m/s.](image)

- **p<0.001**

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Rosenhek et al. *Circulation* 2010;121:151-156
<table>
<thead>
<tr>
<th>Date</th>
<th>Vmax</th>
<th>Mean Δ</th>
<th>AVA</th>
</tr>
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<tbody>
<tr>
<td>Aug 2006</td>
<td>3.7</td>
<td>31</td>
<td>1.3</td>
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<tr>
<td>Jan 2009</td>
<td>4.0</td>
<td>36</td>
<td>1.2</td>
</tr>
<tr>
<td>Dec 2009</td>
<td>4.1</td>
<td>39</td>
<td>1.0</td>
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<tr>
<td>Nov 2010</td>
<td>4.4</td>
<td>45</td>
<td>1.0</td>
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<td>Sept 2011</td>
<td>5.2</td>
<td>68</td>
<td>0.8</td>
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</table>
Asymptomatic Aortic Stenosis

Indications for valve replacement:

- Very severe AS: \( V_{max} \geq 5 \text{ m/s} \)
  - Class IIa

- Rapid progression and low surgical risk
  - Class IIb

- Very severe AS: \( V_{max} > 5.5 \text{ m/s} \)
  - Class IIa

- Severe valve calcification and rate of progression \( \geq 0.3 \text{ m/s/year} \)
  - Class IIa

- Markedly elevated BNP
- Increase in gradient with exercise \( > 20 \text{ mmHg} \)
- Excessive LVH
  - Class IIb
Aortic stenosis

Management challenges:

- The asymptomatic patient with severe AS
- Low-flow, low gradient severe AS
- Indications for TAVR
Aortic stenosis

Management challenges:

- The asymptomatic patient with severe AS
- Low-flow, low gradient severe AS
- Indications for TAVR
  - The symptomatic patient with LV dysfunction and low gradient AS
  - The symptomatic patient with normal LV function and paradoxical low flow, low gradient AS
Inconsistent grading of aortic valve stenosis by current guidelines: haemodynamic studies in patients with apparently normal left ventricular function

Jan Minners, Martin Allgeier, Christa Gohlke-Baerwolf, Rolf-Peter Kienzle, Franz-Josef Neumann, Nikolaus Jander

Heart 2010;96:1463–1468
The Complex Nature of Discordant Severe Calcified Aortic Valve Disease Grading
New Insights From Combined Doppler Echocardiographic and Computed Tomographic Study

Marie-Annick Clavel, DVM, PhD * David Messika-Zeitoun, MD, PhD ++
Philippe Pibarot, DVM, PhD, §
Phillip A. Araoz, MD, * Hector
e Capoulade, MSc, § Ale

J Am Coll Cardiol 2013;62:2239-2238

Clavel et al, J Am Coll Cardiol 2013;62:2239-2238
Low-Flow, Low-Gradient Aortic Stenosis With Normal and Depressed Left Ventricular Ejection Fraction

Philippe Pibarot, DVM, PhD, Jean G. Dumesnil, MD
Québec City, Québec, Canada

Clavel et al, J Am Coll Cardiol 2013;62:2239-2238
Ozkan et al, Nat Review Cardiol 2011;8:494-501
Herrmann et al, J Am Coll Cardiol 2011;58:402-412
Valvular Heart Disease

Impact of Aortic Valve Replacement on Outcome of Symptomatic Patients With Severe Aortic Stenosis With Low Gradient and Preserved Left Ventricular Ejection Fraction

Alper Ozkan, MD; Rory Hachamovitch, MD, MS; Samir R. Kapadia, MD; E. Murat Tuzcu, MD; Thomas H. Marwick, MD, PhD, MPH

from Ozkan et al, Circulation 2013;128:622-631
Low Flow, Low Gradient Aortic Stenosis

Indications for valve replacement:

- Normal EF, if clinical, hemodynamic and anatomic data support severe AS
  - class IIa

- Normal EF only after careful confirmation of severe AS
  - class IIa
Aortic stenosis

Management challenges:

• The asymptomatic patient with severe AS
• Low-flow, low gradient severe AS
• Indications for TAVR
Indications for TAVR vs surgical AVR:

- Evaluation by a Heart Team (class I)
- Surgical AVR for patients at low or intermediate risk (class I)
- TAVR for patients with prohibitive surgical risk and life expectancy >12 months (class I)
- TAVR alternative for patients at high surgical risk (class IIa)
- Percutaneous aortic balloon valvotomy as a bridge to TAVR or surgical AVR (class IIb)
Transcatheter Therapy for Severe AS

Balancing benefits, risks and expectations

• TAVR represents a transformative technology with enormous potential
• Clinical efficacy and safety must temper consumer expectations
• Surgical AVR represents standard with proven safety and durability for majority of patients
• Broad application of TAVR presents challenges in patient selection, cost effectiveness, and need for dedicated, expert heart valve centers

Desai CS, Bonow RO. JAMA 2012;210:573-574
Clinical Outcomes at 1 Year Following Transcatheter Aortic Valve Replacement

David R. Holmes Jr, MD; J. Matthew Brennan, MD, MPH; John S. Rumsfeld, MD, PhD; David Dai, PhD; Sean M. O'Brien, PhD; Sreekanth Vemula, MD; Fred H. Edwards, MD; John Carroll, MD; David Shahian, MD; Fred Grover, MD; E. Murat Tuzcu, MD; Eric D. Peterson, MD, MPH; Ralph G. Brindis, MD, MPH; Michael J. Mack, MD; for the STS/ACC TVT Registry

JAMA. 2015;313:1019-1028

![Graph showing cumulative incidence rate over time for different outcomes: Composite, Mortality, Stroke.](from Holmes et al, JAMA 2015;313:1019-1028)
Aortic Valve Replacement
Hospital Mortality

Medicare 1999-2011

30 Day AVR Mortality (percent)

Year

1999 2001 2003 2005 2007 2009 2011

7.6% 4.2%

Barreto-Filho et al, JAMA 2013;210:2078-2085
Aortic Valve Replacement
Hospital Mortality

Medicare 1999-2011

30 Day AVR Mortality (percent)

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2001</th>
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<th>2005</th>
<th>2007</th>
<th>2009</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥85</td>
<td>12.3%</td>
<td>10.8%</td>
<td>11.0%</td>
<td>10.5%</td>
<td>9.9%</td>
<td>9.3%</td>
<td>5.8%</td>
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<tr>
<td>Age 75-84</td>
<td>5.9%</td>
<td>5.6%</td>
<td>5.4%</td>
<td>5.1%</td>
<td>4.8%</td>
<td>4.5%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Age 65-74</td>
<td>3.3%</td>
<td>3.3%</td>
<td>3.1%</td>
<td>2.9%</td>
<td>2.7%</td>
<td>2.5%</td>
<td>2.0%</td>
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</tbody>
</table>

Barreto-Filho et al, JAMA 2013;210:2078-2085
Improving Outlook for Elderly Patients With Aortic Stenosis

Robert O. Bonow, MD, MS
Challenges in management of AS: Have the guidelines filled the gap?