The Changing Face of VHD Burden

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Changing Pattern of Valvular Disease in Industrialised Countries

(Soler-Soler J, Galve E  Heart 2000;83:721-5)
Prevalence of Valvular Heart Disease

- 11 911 randomly selected patients with echo
- Age-adjusted prevalence of valvular disease 2.5% [95% CI 2.2-2.7]

Prevalence 1.8% in a community-based study

(Nkomo et al. Lancet 2006;368:1005-11)
Euro Heart Survey on Valvular Diseases

3547 Patients with Native Valve Disease (2001)

(Iung et al. Eur Heart J 2003;24:1244-53)
Prevalence of Aortic Stenosis

• 11,911 patients (Nkomo et al. Lancet 2006;368:1005-11)
• 5,201 patients ≥ 65 years (Stewart et al. J Am Coll Cardiol 1997;29:630-4)
• 577 patients ≥ 55 years (Lindroos et al. J Am Coll Cardiol 1993;21:1220-5)

(Iung and Vahanian Nat Rev Cardiol 2011;8:162-72)
Prevalence of AS: Perspectives

- Lack of validated prevention strategies
- Demographic trends

Baby boom

1975

2030

Age

Men

Women

millions

Baby boom

[Graph showing population demographics with age groups and gender distribution]

- [Data points and labels for population distribution by age and gender]

- [Legend indicating baby boom years and different age groups]

- [Visual representation of population trends over time]
Prevalence of Aortic Sclerosis

- Thickening of aortic valve without obstruction (v. max < 2.5 m/sec.)
- Prevalence in 5,201 patients ≥ 65 years: 26% (men 31%, women 22%)

(Stewart et al. J Am Coll Cardiol 1997;29:630-4)
Progression of Aortic Sclerosis

• 2131 patients with aortic sclerosis (valve thickening with v. max < 2 m/sec.)

• Progression toward AS in 15.9% of cases (mean FU 7 years) vs. 1% in patients with non-thickened aortic valves:
  – 10.5% mild AS (mean gradient < 25 mmHg)
  – 2.9% moderate AS (mean gradient 25-45 mmHg)
  – 2.5% severe AS (mean gradient ≥ 45 mmHg)

• Predictive factor: calcification of mitral annulus

(Cosmi et al. Arch Intern Med 2002;162:2345-7)
## Aortic Sclerosis
### Predictive Factors

<table>
<thead>
<tr>
<th>Predictor</th>
<th>OR [IC 95%]</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>2.2 [2.1-2.2]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male gender</td>
<td>2.0 [1.7-2.5]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lp(a)</td>
<td>1.2 [1.1-1.3]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>0.84 [0.78-0.93]</td>
<td>0.001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.2 [1.1-1.4]</td>
<td>0.002</td>
</tr>
<tr>
<td>Active smoking</td>
<td>1.4 [1.1-1.7]</td>
<td>0.006</td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>1.12 [1.03-1.23]</td>
<td>0.008</td>
</tr>
</tbody>
</table>

*(Stewart et al. J Am Coll Cardiol 1997;29:630-4)*
Calcific Aortic Valve Disease and Atherosclerosis

• Common risk factors
  \((Age, HTA, smoking, LDL, diabetes)\)

• Histologic and histochemical abnormalities

• Aortic sclerosis and cardiovascular risk

- 49% had bicuspid aortic valves
- Age at intervention
  - bicuspid: 67 ± 11 (27-91)
  - tricuspid: 74 ± 8 (45-91)

(Roberts et al. Circulation 2005;111:920-5)
Progression of Aortic Stenosis in BAV

- In most cases, aortic stenosis is the consequence of a superimposed « degenerative » process

- Development of AS is also linked to cardiovascular risk factors in patients with BAV
  - Hypercholesteroleemia OR 1.8 [1.1-2.8]
  - Hypertension OR 2.6 [1.1-6.6]

(Chan et al. Am J Cardiol 2001;88:690-3)
Natural History of Bicuspid Aortic Valve

212 patients (32 ± 20 yrs) with normally functioning bicuspid aortic valve (gradient <20 mmHg and AR ≤ 1/4)

- AVR: 39 patients (27 for severe AS)
- Coarctation: 8 patients
- Surgery of ascending aorta: 8 patients

(Michelena et al. Circulation 2008;117:2776-84)
Genetic Component of Aortic Stenosis

From geographic aggregation to genealogy

(Probst et al. Circulation 2006;113:856-60)
Valvular Regurgitations

- 2,881 pts from the Framingham cohort
- All had Doppler-echocardiography

<table>
<thead>
<tr>
<th>Valve</th>
<th>All (%)</th>
<th>≥ Mild (%)</th>
<th>≥ Moderate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitral</td>
<td>90</td>
<td>19</td>
<td>1.6</td>
</tr>
<tr>
<td>Aortic</td>
<td>11</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Tricuspid</td>
<td>84</td>
<td>16</td>
<td>0.8</td>
</tr>
</tbody>
</table>

(Singh et al. Am J Cardiol 1999;83:897-902)
Valvular Regurgitations

- Prevalence according to age

(Singh et al. Am J Cardiol 1999;83:897-902)
Organic MR

3491 pts from the Framingham cohort

- 2.4% had mitral valve prolapse
  (1.3% classic, 1.1% non-classic)
- Mitral regurgitation was severe in 3.5% of them
  (7% of classic prolapse)
- No relationship with cardiovascular risk factors

Ischemic MR After Myocardial Infarction
Community-Based Study

- 773 patients undergoing echocardiography within 30 days following myocardial infarction: 50% ≥ mild MR

- Overall Survival

- Ischemic MR was a predictor of death in multivariate analysis: adjusted HR 1.55 [1.08-2.22] p=0.019

(Bursi et al. Circulation 2005;111:295-301)
Aortic Regurgitation

- Degenerative AR
  - Valve prolapse
  - Dilatation of sinotubular junction
- Rheumatic heart disease
- Endocarditis
- Bicuspid valve
- Aortitis
Mitral Stenosis

- The only valvular disease to remain mainly due to rheumatic heart disease (85% of cases in Europe)
- 9% of single-valve disease in the Euro Heart Survey
- Mean age 58 years, 81% women
- 31% had previously undergone commissurotomy (9% percutaneous, 22% surgical)
- Seldom caused by calcific degenerative mitral valve disease (annulus + valve)

(Iung et al. Curr Prob Cardiol 2007;32: 609-61)
Developing Countries
Rheumatic Heart Disease

• Prevalence in school-age children when using clinical screening
  – 1-6 / 1000 in Asia (Carapetis Circulation 2008;118:2748-53)
  – 2-14 / 1000 in Africa (Nkomo et al. Heart 2007; 93:1510-9)

• < 20% of patients aware of valvular disease and 8% under prophylaxis
  (Rizwi et al. Heart 2004;90:394-9)

• Prevalence estimated at 22-30 / 1000 in school-age children when using echocardiographic screening
Developing Countries
Prevalence of Rheumatic Heart Disease

(Carapetis et al. Lancet Inf Dis 2005;5:685-94)
Valvular surgery was AVR in 67% of cases in 2009.
Increase in patient age and comorbidities between 1997 and 2006.

(Brown et al. JTCS 2009;137:82-90)
Conclusion (I)

• Valvular heart disease remains frequent in industrialised countries, where its prevalence increases in the elderly.

• This is the consequence of the predominance of degenerative valvular diseases (mainly AS and MR), which represent a heterogeneous group.

• Expected increase in prevalence
  - Population ageing
  - Lack of validated prevention strategies

• Impact on the complexity of decision-making

• Need for improving the understanding of the pathophysiology of degenerative valvular diseases
Conclusion (II)

- Valvular surgery accounts for more than 20% of all procedures of cardiac surgery and its proportion has increased over the last decade.
- Need for the development of less invasive interventions.
- Persistence of a high burden of rheumatic heart diseases in developing countries:
  - Over-mortality in young patients
  - Underestimation from clinical screening
  - Need to implement strategies of early diagnosis and prevention
# Infective Endocarditis

<table>
<thead>
<tr>
<th></th>
<th>French Survey (n=390)</th>
<th>ICE (n=2781)</th>
<th>Euro Heart Survey (n=159)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (yrs)</td>
<td>59</td>
<td>58</td>
<td>56</td>
</tr>
<tr>
<td>Male (%)</td>
<td>71</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Prosthetic endocarditis (%)</td>
<td>16</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>IV drug use (%)</td>
<td>6</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Microorganisms (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- streptococci (oral)</td>
<td>58 (17)</td>
<td>39 (17)</td>
<td>42 (13)</td>
</tr>
<tr>
<td>- staphylococci</td>
<td>29</td>
<td>42</td>
<td>33</td>
</tr>
<tr>
<td>Surgery (%)</td>
<td>49</td>
<td>48</td>
<td>52</td>
</tr>
<tr>
<td>In-hospital mortality (%)</td>
<td>16</td>
<td>18</td>
<td>13</td>
</tr>
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Hoen et al. JAMA 2002;288:75-81  
## From 1991 to 2008: some trends

<table>
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<th>Per million</th>
<th>1991</th>
<th>1999</th>
<th>2008</th>
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<tr>
<td>Overall crude incidence</td>
<td>31.4 [28.1-35.0]</td>
<td>31.0 [27.7-34.5]</td>
<td>29.5 [26.4-32.8]</td>
</tr>
<tr>
<td>Overall standardized incidence*</td>
<td>35.0 [31.3-39.0]</td>
<td>33.4 [29.9-37.2]</td>
<td>31.7 [28.3-35.2]</td>
</tr>
</tbody>
</table>

Incidences rate were calculated since both common regions to study: Rhône-Alpes, Lorraine and Paris et petite couronne and on a population aged >=20 years old.

*standardized on the 2007 French population aged >=20 years old by age and by sex.
From 1991 to 2008: some trends

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<tr>
<td><strong>Standardized incidence by causative microorganisms</strong>*</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Oral streptococci</td>
<td>8.0 [6.3-10.0]</td>
<td>6.3 [4.8-8.0]</td>
<td>6.3 [4.9-8.0]</td>
</tr>
<tr>
<td>Group D streptococci</td>
<td>6.4 [4.8-8.3]</td>
<td>8.4 [6.7-10.5]</td>
<td>4.0 [2.9-5.4]</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>5.2 [3.9-6.8]</td>
<td>6.9 [5.4-8.7]</td>
<td>8.0 [6.3-9.8]</td>
</tr>
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Incidences rate were calculated since both common regions to study: Rhône-Alpes, Lorraine and Paris et petite couronne and on a population aged >=20 years old.

*standardized on the 2007 French population aged >=20 years old by age and by sex
Etiologies of Aortic Stenosis

(Iung et al. Curr Prob Cardiol 2007;32: 609-61)