Structural deterioration of the cryopreserved mitral homograft valve


Department of Cardiac Surgery, Hôpital Pitié-Salpêtrière
Paris, France
83 patients with mitral homograft >1yr FU

Age: 36 yrs with 6 children

Aetiology:
- Rheumatic 69%
- Bacterial endocarditis 24%
- Others: Barlow, immune dis., congenital 17%

Homograft technique:
- Partial replacement 37%
  - Anterior leaflet patch 8%
  - Hemivalve 29%
- Total replacement 63%
## Echocardiography

<table>
<thead>
<tr>
<th></th>
<th>MR grade</th>
<th>Mean gradient</th>
<th>Valve area</th>
<th>Systolic PAP</th>
<th>EF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At discharge</strong></td>
<td>0.4</td>
<td>3.9 mmHg</td>
<td>2.3 cm²</td>
<td>32 mmHg</td>
<td>60%</td>
</tr>
<tr>
<td><strong>At 8.2 yrs FU</strong></td>
<td>1.3</td>
<td>7.1 mmHg</td>
<td>1.7 cm²</td>
<td>38 mmHg</td>
<td>59%</td>
</tr>
<tr>
<td><em>p</em></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.0013</td>
<td>0.51</td>
</tr>
</tbody>
</table>

* No difference among subgroups:
  - partial vs total, age < or > 40yrs, ring size < or > 30 mm
Leaflet thickening already present at 8 yrs
Considerably worsened by 14 yrs

Hyperechogenicity of a single papillary muscle following partial mitral homograft
Clinical results at 9.9 yrs

- Half of the deaths were cardiac related.

- Causes of reoperation were:
  - degeneration (76%), endocarditis (14%) & aortic valve dis. (10%)

- Mortality at reoperation 2/29 (6.9%)
  - one death due to technical problems in replacing the aortic homograft

- Homograft dysfunction was defined as:
  - MR grade ¾ or gradient >10 mmHg or area<1cm2

- During the study period, 7 women gave birth to 13 children
Pathological findings

- Leaflets: retraction & calcification
- Chordae: shortening & thickening
- Rarely: rupture of secondary chords

14 yrs
Pathological findings

- Papillary muscles: excellent healing.
- Fibrotic scar with strong attachment to the left ventricular muscle.
Microscopy

- Destruction of the normal 3-layer architecture
- Severe fibrosis & calcifications
- Complete lack of cellularity
Determinants of reoperation

- Combined aortic valve surgery
  - Repair (n=5) or homograft (n=9)
  - Reoperation: 50% vs 32% for isolated mitrals  \( p=0.19 \)

- Endocarditis as primary indication
  - 3 out of 4 mitral homograft infection cases had endocarditis as primary indication  \( p<0.02 \)

- Smaller ring size:
  - Total vs partial homograft: 31.1 vs 32.2 mm  \( p=0.008 \)
  - Age <40 yrs vs age >40 yrs: 31.1 vs 31.9 mm  \( p=0.06 \)
  - All valves with a 28 mm ring were reoperated  \( p=0.01 \)

- Total vs partial homograft
  - Reoperation: 42% vs 23%  \( p=0.10 \)
Determinants of dysfunction

- MR was identical among subgroups

- Stenosis was markedly more pronounced with:
  - Gradient: 7.9-8.4 vs 5.5-6.0 mmHg  p<0.001
  - Valve area: 1.5-1.6 vs 1.9 cm²  p<0.01

Total vs partial homograft

- Age <40 yrs vs age >40 yrs
- Ring size 30 mm or less vs ring > 30 mm
Conclusion

- Mitral homografting can be realized with early echo results comparable to those of valve repair.
- Cryopreservation does not prevent degeneration of the mitral homograft valve.
- The failure mode is progressive and implies a mixture of stenosis and insufficiency.
- Degeneration of the mitral homograft is more pronounced in:
  - total vs partial homograft
  - younger patients (children & pts < 40 yrs)
  - smaller prosthetic ring size (≤ 30 mm)