Long-term outcome of aortic valve plasty utilizing an autologous pericardial patch in patients with severe aortic stenosis

Takenori Otsuka  Makoto Suzuki  Tsukasa Osaki
Takako Tsuchida  Hisao Yoshikawa  Masayoshi Matsuyama
Hiromasa Yamashita  Makoto Uchida  Shigeyuki Ozaki
Kaoru Sugi

Toho University Ohashi Medical Center, Cardiovascular Medicine, Tokyo Japan
Abstract

**Background:** We report our experience with using an aortic valve plasty technique to repair a stenotic aortic valve.

**Methods:** Sixty-eight patients underwent aortic valve plasty. Fifteen of these patients had a bicuspid valve. The characteristics of the patients were as follows: the mean age ± standard deviation was 73 ± 9 years; the aortic valve area, 0.74 ± 0.20 cm²; the pressure gradient between the left ventricle and the aorta, 80.7 ± 29.7 mm Hg; and the left ventricular ejection fraction, 64% ± 13%. Aortic valve plasty was performed using our unique technique that creates an individual aortic valve from an autologous pericardial patch. Both transesophageal and transthoracic echocardiography were used to assess each patient’s perioperative condition.

**Results:** There was no early mortality. Postoperative aortic regurgitation was absent in 45 patients, trivial in 22 patients, and mild in one patient. The peak systolic pressure gradient across the aortic valve was 18.5 ± 8.3 mm Hg after valve plasty. No patient underwent reoperation for any reason. Peak systolic gradient was significantly lower in aortic valve plasty group compared with aortic valve replacement group using biosprosthetic valve with or without stent (18.5 ± 8.3 vs 28.3 ± 10.2, respectively, p< 0.0001). The peak systolic gradient was 12.9 ± 7.1 mm Hg after two years. Up to two years later, there was no significant increase in the peak systolic gradient or significant worsening in aortic regurgitation.

**Conclusion:** Aortic valve plasty is safe and feasible to treat patients with severe aortic stenosis. Furthermore, there was no significant worsening about residual pressure gradient or aortic regurgitation up to two years.
Background

1 Calcified stenotic aortic valve or bicuspid valves are usually replaced by the artificial valve.

2 Aortic valve plasty are still not authorized operation technique for aortic stenotic patients.

3 We report our experience with using an aortic valve plasty technique to repair a stenotic aortic valve.
The purpose of this study is to verify feasibility of aortic valve plasty for patients with severe aortic stenosis.
Patients characteristics 1 (valve plasty)

Sixty-eight patients who underwent valve plasty

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcified aortic stenosis</td>
<td>53</td>
</tr>
<tr>
<td>Bicuspid aortic valve</td>
<td>15</td>
</tr>
<tr>
<td>Mean age</td>
<td>73±9</td>
</tr>
<tr>
<td>Aortic valve area</td>
<td>0.74±0.20cm²</td>
</tr>
<tr>
<td>Peak pressure gradient (LV-Ao)</td>
<td>80.7±29.7mmHg</td>
</tr>
<tr>
<td>Ejection Fraction</td>
<td>64±13%</td>
</tr>
</tbody>
</table>
Thirty patients who underwent valve replacement

| Patients characteristics 2 (valve replacement) |  
|-----------------------------------------------|---|
| Calcified aortic stenosis | 23 |
| Bicuspid aortic valve | 7 |
| Mean age | 76±7 |
| Aortic valve area | 0.80±0.18cm² |
| Peak pressure gradient (LV-Ao) | 89.1±28.9mmHg |
| Ejection Fraction | 66±14% |
Methods 1

- Harvest of *autologous pericardium*.
- Clean remnants of *fat*.
- Place pericardium in a bowl of *0.6% buffered glutaraldehyde* for *10 mins*.
- Aortic valve and annulus decalcification by Cavitron ultrasonic Surgical Aspirator (*CUSA*).
- Distance between each commissure parts is measured in that case using *our original apparatus for valvular leaflet plasty*.
- Leaflet of the size corresponding to the measurement value is made with *a template* by the autologous glutaraldehyde treated pericardium.
- Annular margin of the pericardial leaflet was running sutured to the each coronary annulus by using *4-0 polypropylene*. 
Methods 2

pericardial patch
Residual pressure gradients after aortic valve plasty is compared with that of bioprosthetic valve replacement.
Result 1

1. There was no early mortality.

2. Degree of postoperative aortic regurgitation (AR) were non in 45 cases, trivial in 22 cases and mild in 1 case.

3. Peak systolic gradients across the aortic valve were $18.5 \pm 8.3$ mmHg after aortic plasty.
Figure 1

Peak systolic pressure gradient after surgery

bioprosthetic valve vs valve plasty

mmHg

post LV-Ao pressure gradient

Bioprosthetic valve

postoperative

one year after

two year after

NS

p<0.001
Result 2

1. Residual pressure gradients across the aortic valve is also significantly lower compared with conventional valve replacement. (Figure 1)

2. There is no significant increase in peak systolic gradient up to two years later. (Figure 1)

3. There is no significant worsening in aortic regurgitation up to two years later. (Figure 2)
Figure 2

postoperative AR

postoperative
6 month after
1 year after
2 year after

NS
NS
NS
Representative case 1

pre operation  post operation
Representative case 1

TEE

pre operation

post operation
Representative case 2

Pre OPE

Post OPE

Raphe

Autologous pericardium
Representative case 2

TEE

pre operation

post operation
Conclusion

1. Aortic valve plasty is safe and feasible for severe aortic stenosis.

2. There was no significant worsening about residual pressure gradient or aortic regurgitation up to two years.