20 Years of Bicuspid Aortic Valve Repair

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Valvuloplasty for aortic insufficiency

Twenty-eight consecutive patients underwent aortic valvuloplasty for aortic insufficiency caused by leaflet prolapse. The technique involved triangular resection of the free edge of the prolapsing leaflet, annular plication at the commissure, and resection of a raphe when present in bicuspid valves. Mean age of the patients was 46.8 ± 14.4 years. Twenty-six (92.7%) were male. Seventy-five percent of the patients had a bicuspid aortic valve; the remaining valves were tricuspid. The extent of aortic insufficiency was 3.6 ± 0.8 by aortography, 3.1 ± 0.1 by preoperative Doppler echocardiography, and 3.4 ± 0.7 by intraoperative Doppler echocardiography. The amount of aortic insufficiency decreased from 3.4 ± 0.7 to 0.6 ± 0.5 intraoperatively, immediately after repair (p < 0.001). Mean transvalvular gradient by echocardiography was 12.9 ± 6.8 mm Hg. There was one death in a patient who had an intraoperative cerebral vascular accident. Mean follow-up was complete at 6.9 months. One patient had a cerebral vascular accident and one patient required reoperation for recurrent aortic insufficiency caused by partial suture line dehiscence. In 15 patients with late echocardiograms, aortic insufficiency did not progress (0.7 ± 0.6 in the hospital and 0.8 ± 0.5 late). Aortic valve repair for aortic cusp prolapse effectively eliminates aortic insufficiency without causing aortic stenosis. At early follow-up the repair has been stable.

Delos M. Cosgrove, MD, Eliot R. Rosenkranz, MD (by invitation),
William G. Hendren, MD (by invitation), James C. Bartlett, DOa (by invitation), and
William J. Stewart, MDa (by invitation), Cleveland, Ohio
Surgical Techniques for Aortic Valvuloplasty

Since 1988, reparative techniques have been used at our institution to treat valvular insufficiency in selected patients with aortic valve disease. The limitations of aortic valve replacement are well recognized; it is this knowledge that has motivated us to find out whether a subgroup of patients who have aortic insufficiency might be candidates for preservation of their native aortic valves. This subgroup includes patients who have leaflet prolapse, perforation, or calcification. We describe our methods of patient evaluation and selection, as well as our surgical techniques for both bicuspid and tricuspid aortic valve repair. *(Texas Heart Institute Journal 1994;21:305-9)*
First Steps

**Repair of Insufficient Bicuspid Aortic Valves**

Charles D. F., Patrick M. H., Delos M. C., W. Lytle, MD, Department of Thoracic Surgery, Cleveland, Ohio

A technique for repair includes resection of the short leaflet, annulus replacement, has been developed. To assess the technique in the management of bicuspid aortic valves, the results of a study of 23 patients were presented. The mortality rate was 14%, and 94% were alive at follow-up. The mean aortic insufficiency time was 39 ± 12 minutes. There were no operative deaths. The severity of aortic insufficiency, as assessed by Doppler echocardiography (graded from 0 to 4) preoperatively, was 3.6 versus the preoperative values. The follow-up was 3.6 years, with a p value of 0.05 versus the preoperative values.

The paravalvular leak was 94% and 89.5%, respectively. The follow-up period was 3.6 years, with a p value of 0.05 versus the preoperative values. The follow-up rate was 94% and 89.5%, respectively. The follow-up period was 3.6 years, with a p value of 0.05 versus the preoperative values. The follow-up period was 3.6 years, with a p value of 0.05 versus the preoperative values.

*Ann Thorac Surg 1994;58:386–90*
Midterm Results

Interval (years) | % Free
---|---
30 d | 99%
1 | 95%
3 | 90%
5 | 87%
7 | 84%

Interval (Years) After Operation
Echocardiographic Results After Repair of Incompetent Bicuspid Aortic Valves

Reinhard Moidl, MD, Anton Moritz, MD, Paul Simon, MD, Natascha Kupilik, MD, Ernst Wolner, MD, and Werner Mohl, MD, PhD

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Underestimated aortic pathology?
Remodeling of the Aortic Root and Reconstruction of the Bicuspid Aortic Valve

Hans-Joachim Schäfers, MD, PhD, Frank Langer, MD, Diana Aicher, MD, Thomas P. Graeter, MD, and Olaf Wendler, MD

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Background. Currently, isolated reconstruction of a regurgitant bicuspid aortic valve can be performed with adequate early results. Dilatation of the proximal aorta is known to be associated with this valve anomaly and may be partially responsible for the development of primary regurgitation or secondary failure of valve repair. We have used repair of the bicuspid valve with remodeling of the aortic root as an alternative to insertion of a composite graft.

Methods. Between October 1995 and May 1999, 16 patients (12 men, 4 women, aged 35 to 73 years) were seen with a regurgitant bicuspid aortic valve and dilatation of the proximal aorta of more than 50 mm. All patients underwent repair of the valve using either coapting sutures alone (n = 12) or in combination with triangular resection of a median raphe (n = 4). Using a Dacron graft, the aortic root was remodeled and the ascending aorta (n = 16) and proximal arch (n = 4) replaced.

Results. No patient died. The postoperative degree of aortic regurgitation was less than grade II in all patients. Valve function has remained stable in all patients between 2 and 43 months postoperatively.

Conclusions. Reconstruction of the regurgitant bicuspid valve in the presence of proximal aortic dilatation is feasible with good results by combining the root remodeling technique with valve repair.

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The Homburg Experience

Valve-sparing aortic root replacement in bicuspid aortic valves: A reasonable option?

Diana Aicher, MD
Frank Langer, MD
Anke Kissinger
Henning Lausberg, MD
Roland Fries, MD
Hans-Joachim Schäfers, MD

Follow-up (months)

%
The Homburg Experience

A new approach to the assessment of aortic cusp geometry

Hans-Joachim Schäfers, MD, PhD, Benjamin Bierbach, MD, and Diana Aicher, MD, Homburg/Saar, Germany

• Systematic approach
• Objective analysis of cusp prolapse
• Prolapse of the fused AND nonfused cusp
The Homburg Experience

Preservation of the Bicuspid Aortic Valve
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AVR + Root Remodeling
↑
AVR + Sinutubular Junction Remodeling
↓
Isolated BAV Repair
The Homburg Experience
The Homburg Experience

![Image showing a medical procedure]

![Graph showing follow-up data with and without pericardium]

P < 0.0001
The Homburg Experience
The Homburg Experience
Risk factors for repair failure

- Subcommissural plication
- Enlarged basal ring
- Unfavorable commissural orientation
- Use of a pericardial patch
2009: Suture Annuloplasty

Suture Annuloplasty in Aortic Valve Repair

Ulrich Schneider, MD, Diana Aicher, MD, Yuijo Miura, MD, and Hans-Joachim Schäfers, MD
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Early results with annular support in reconstruction of the bicuspid aortic valve

Diana Aicher, MD, Ulrich Schneider, Wolfram Schmied, Dipl Psych, Takashi Kunihara, MD, Masato Tochii, MD, and Hans-Joachim Schäfers, MD, PhD

Graph showing early results over time with and without annular support, indicating a p-value of 0.07.
Suture Annuloplasty

“Suture Annuloplasty Significantly Improves the Durability of Bicuspid Aortic Valve Repair”

Graphs showing freedom from re-operation and freedom from severe aortic regurgitation.
The Homburg Experience

Risk factors for repair failure

• Subcommissural complication

• Enlarged basal ring  \(\rightarrow\) Suture Annuloplasty

• Unfavorable comissural orientation

• Use of a pericardial patch
Sinus Plication

**Hypothesis:** Reducing the circumference of the fused sinuses should improve valve configuration.
Sinus Plication

Freedom from Re-OP

Freedom from AR ≥ II

sinus plication n = 35
n (≥ II) = 7
w/o sinus plication n = 21
n (≥ II) = 14
p = 0.0024
The Homburg Experience

Risk factors for repair failure

- Subcommissural plication
- Enlarged basal ring  ➔ Suture Annuloplasty
- Unfavorable commissural orientation  ➔ Sinus Plication
- Use of a pericardial patch  ???

Valve Configuration Determines Long-Term Results After Repair of the Bicuspid Aortic Valve
Diana Aicher, Takashi Kunihara, Omar Abou Issa, Brigitte Brittner, Stefan Gräber and Hans-Joachim Schäfers
Conclusion

• BAV repair successful using systematic approach
• Known risk factors + surgical solutions
• Coming up next:
  – Long-term results for BAV repair + root remodeling
• Still pending:
  – Pericardial patch
Thank you!