

20 Years of Bicuspid Aortic Valve Repair

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Background

- BAV most common cardiac anomaly
- >50% of patients develop aortic dilatation
- AR as consequence of stretching of the fused cusp

First Steps

J THORAC CARDIOVASC SURG 1991;102:571-7

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, DO^a (by invitation), and
William J. Stewart, MD^a (by invitation), *Cleveland, Ohio*

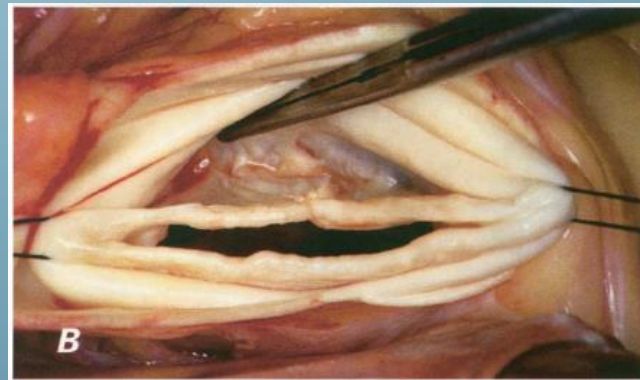
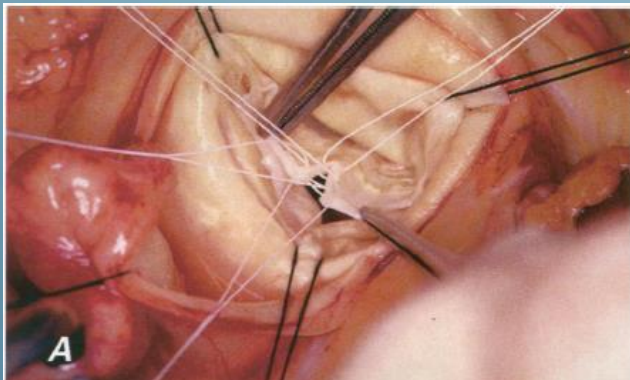
First Steps

*Denton A. Cooley's
50th Anniversary
in Medicine*

Surgical Techniques for Aortic Valvuloplasty

Charles D. Fraser, Jr., MD
Delos M. Cosgrove III, MD

*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. Fraser, Jr, MD, Nan Wang, MD, Roger B. B. Mee, FRACS, Bruce W. Lytle, MD, Patrick M. McCarthy, MD, Shelly K. Sapp, MS, Eliot R. Rosenkranz, MD, and Delos M. Cosgrove III, MD

Department of Thoracic and Cardiovascular Surgery and Department of Biostatistics, The Cleveland Clinic Foundation, Cleveland, Ohio

A technique for the repair of bicuspid aortic valves that includes resection of the flail segment of the prolapsing leaflet, annuloplasty, and resection of the raphe, when present, has been reported. To assess the efficacy of this technique in the repair of insufficient bicuspid aortic valves, the results in 72 consecutive patients were assessed. The mean age of the patients was 39 ± 11 years; 94% were male. Fifty-six patients (78%) underwent isolated aortic valve repair, 9 (12.5%) underwent aortic and mitral valve repair, and 7 (9.7%) had other associated procedures. All patients underwent leaflet resection, including 35 (48%) at the raphe. The mean aortic occlusion 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) preoper-

atively and intraoperatively and at late follow-up, was 3.6 ± 0.6 , 0.4 ± 0.4 , and 0.9 ± 0.8 , respectively, with a p value of <0.0001 for the latter two values versus the preoperative one. There have been no postoperative deaths. Patients did not receive anticoagulation treatment and there were no strokes or episodes of endocarditis. Six patients have required reoperation: 3 underwent repeat repair.

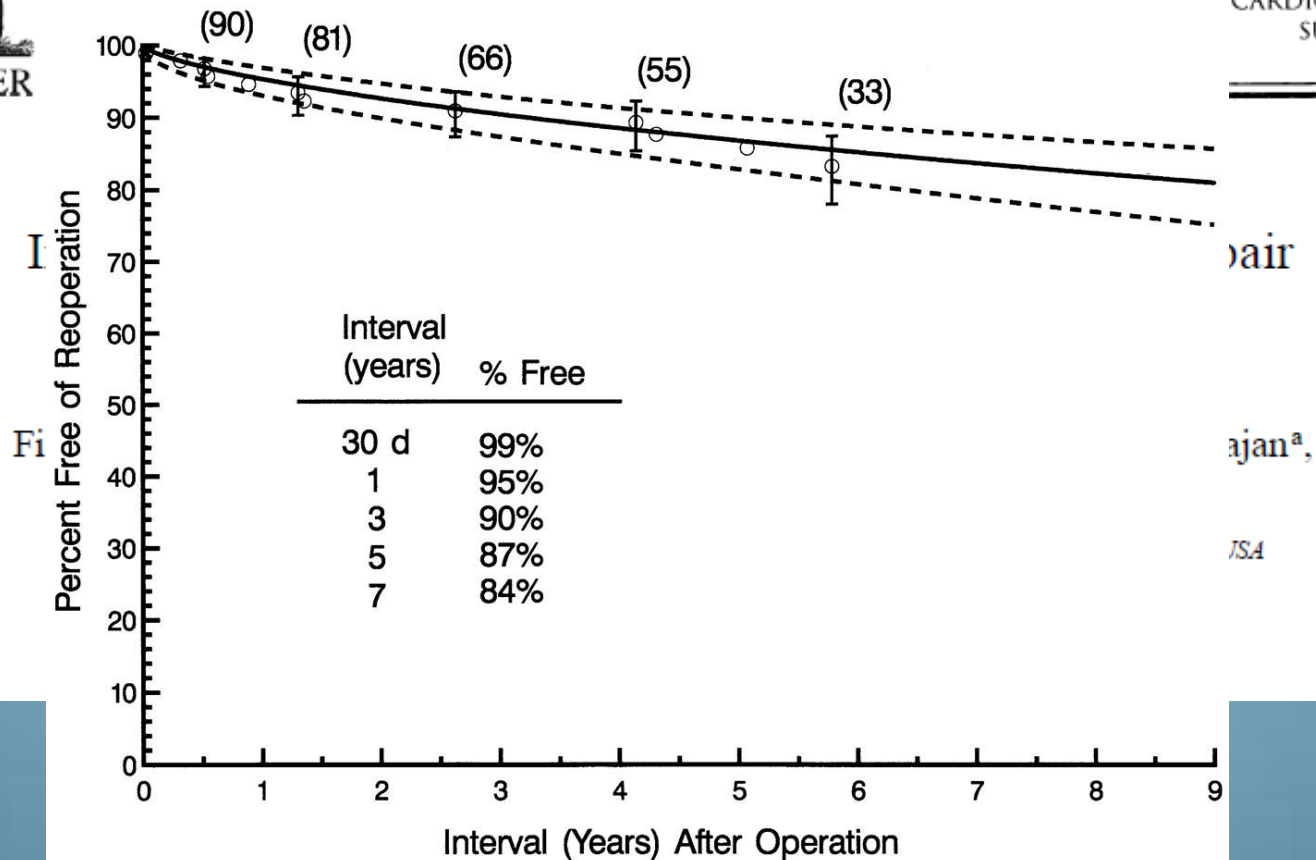
The Kaplan-Meier freedom from aortic valve reoperation probabilities at 12 and 24 months were 94% and 89.5%, respectively. We conclude that valvuloplasty for insufficient bicuspid aortic valves is technically safe, is associated with a low incidence of recurrent insufficiency, and has been associated with no other valve-related complications.

(Ann Thorac Surg 1994;58:386-90)

Midterm Results



EUROPEAN JOURNAL OF
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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

Department of Cardiothoracic Surgery, University of Vienna, Vienna, Austria

Underestimated aortic pathology?

The Homburg Experience

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

Department of Thoracic and Cardiovascular Surgery, University Hospitals Homburg, Homburg, Germany

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.

(Ann Thorac Surg 2000;70:542–6)

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The Homburg Experience

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

Diana Aicher, MD^a

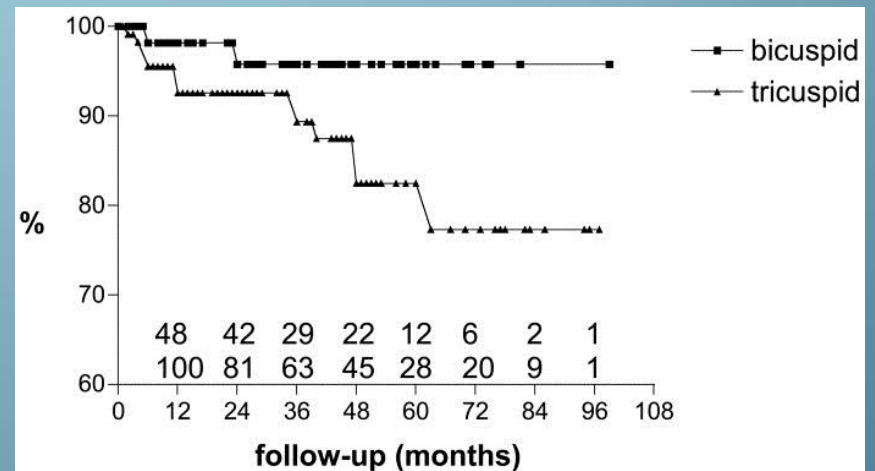
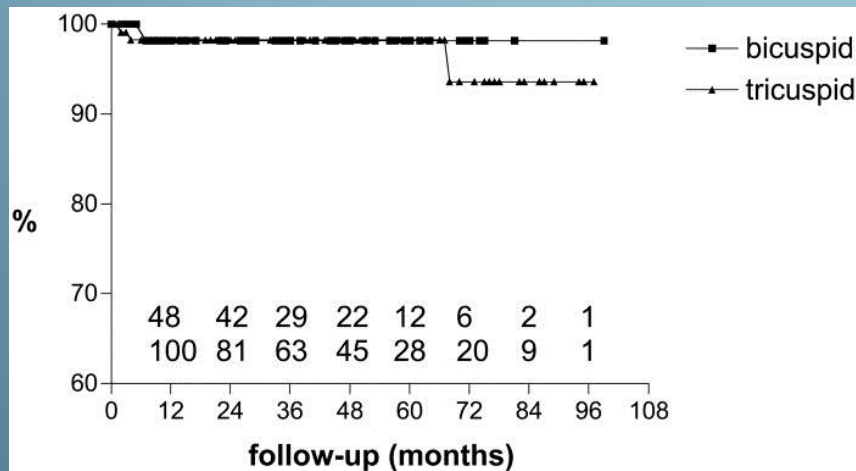
Frank Langer, MD^a

Anke Kissinger^a

Henning Lausberg, MD^a

Roland Fries, MD^b

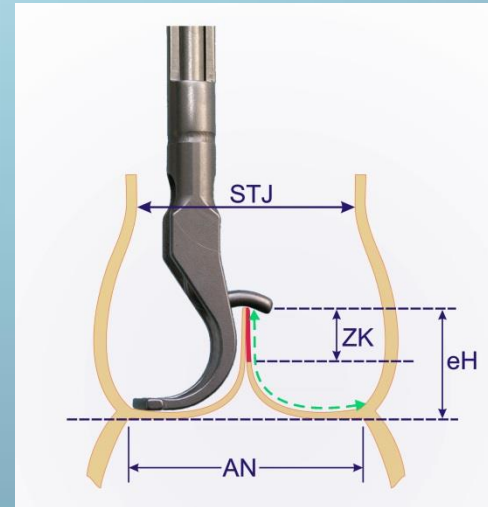
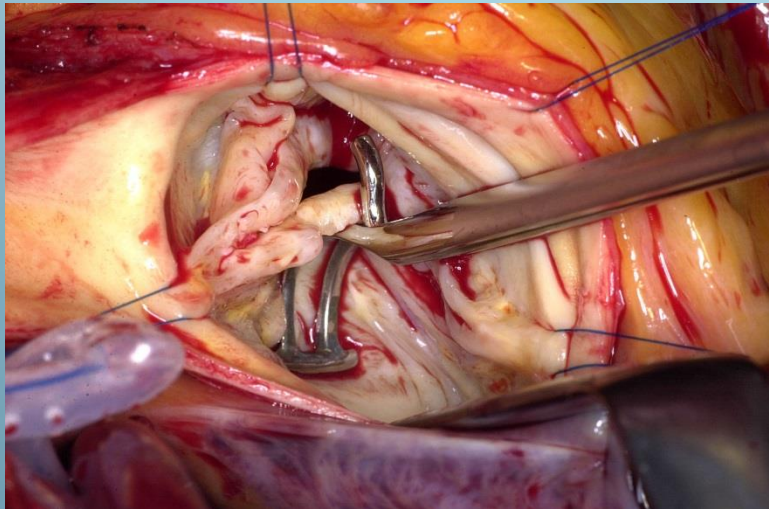
Hans-Joachim Schäfers, MD^a



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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

Hans-Joachim Schäfers, MD, PhD, Diana Aicher, MD, Frank Langer, MD,
and Henning F. Lausberg, MD

Department of Thoracic and Cardiovascular Surgery, University Hospitals of Saarland, Homburg/Saar, Germany

AVR + Root Remodeling

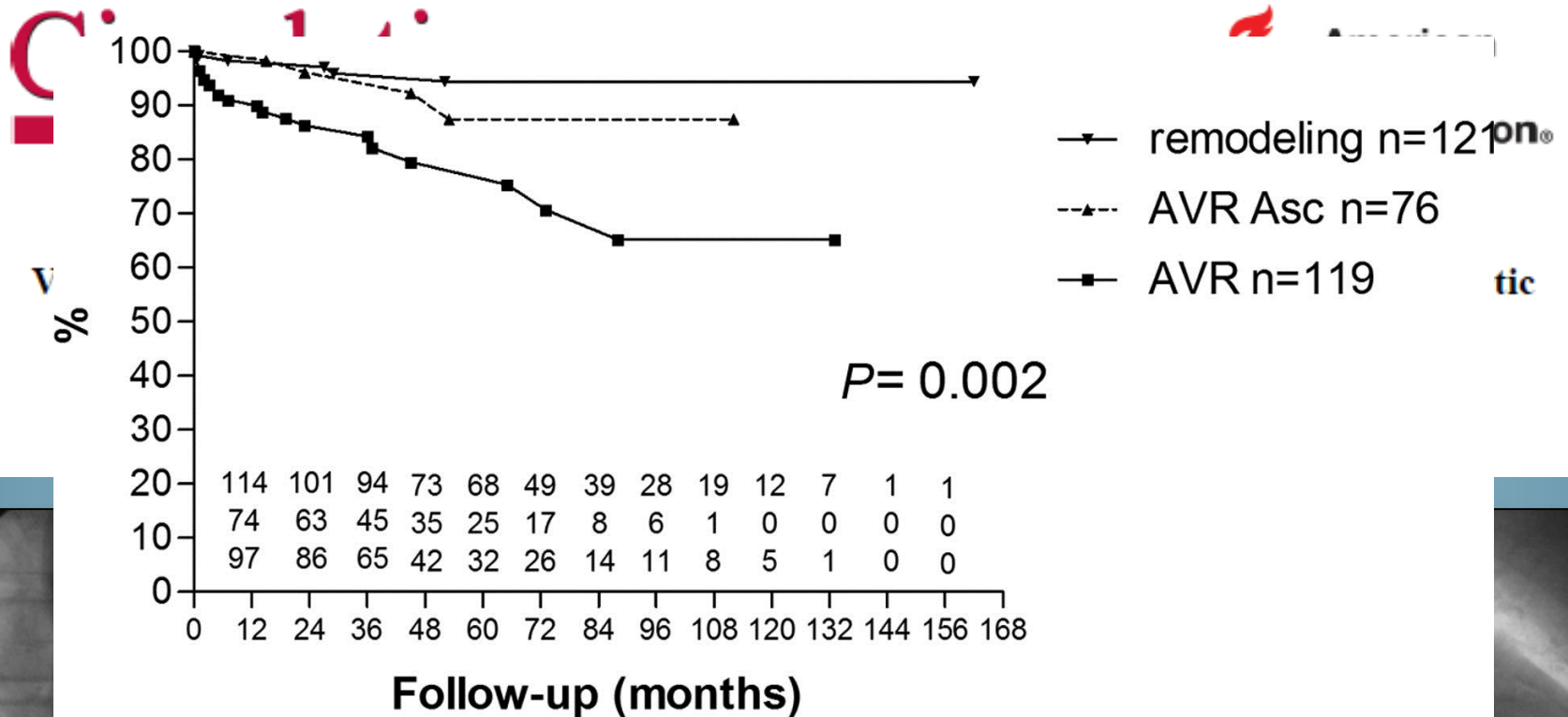


AVR + Sinutubular Junction Remodeling

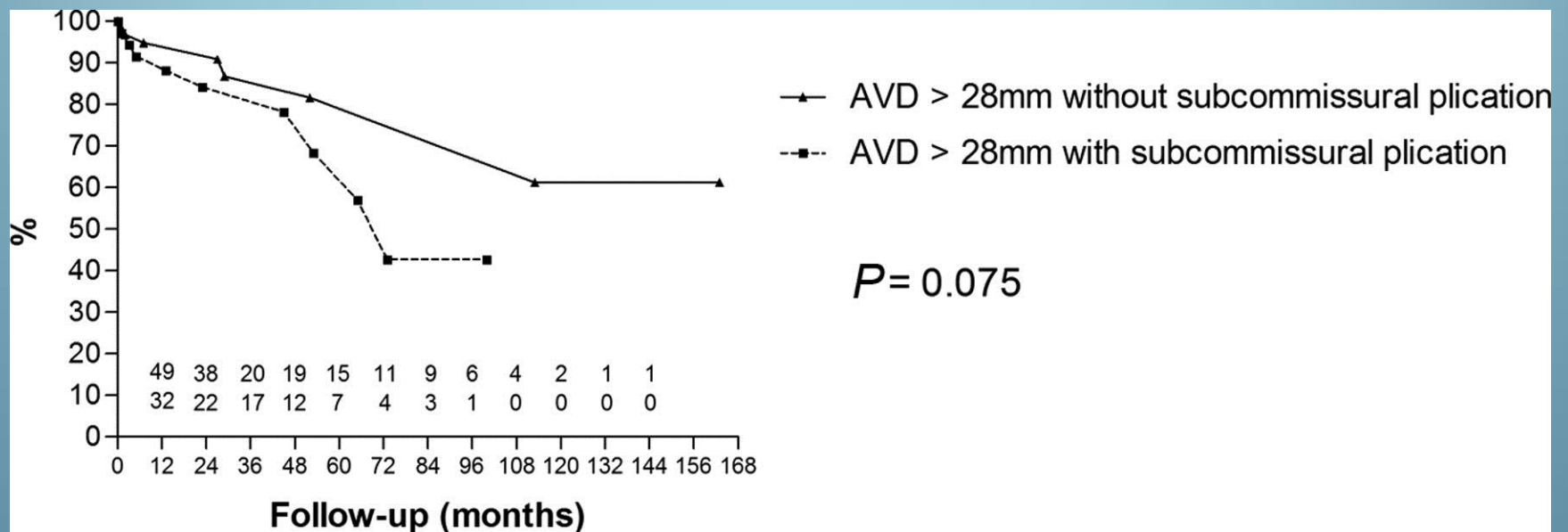


Isolated BAV Repair

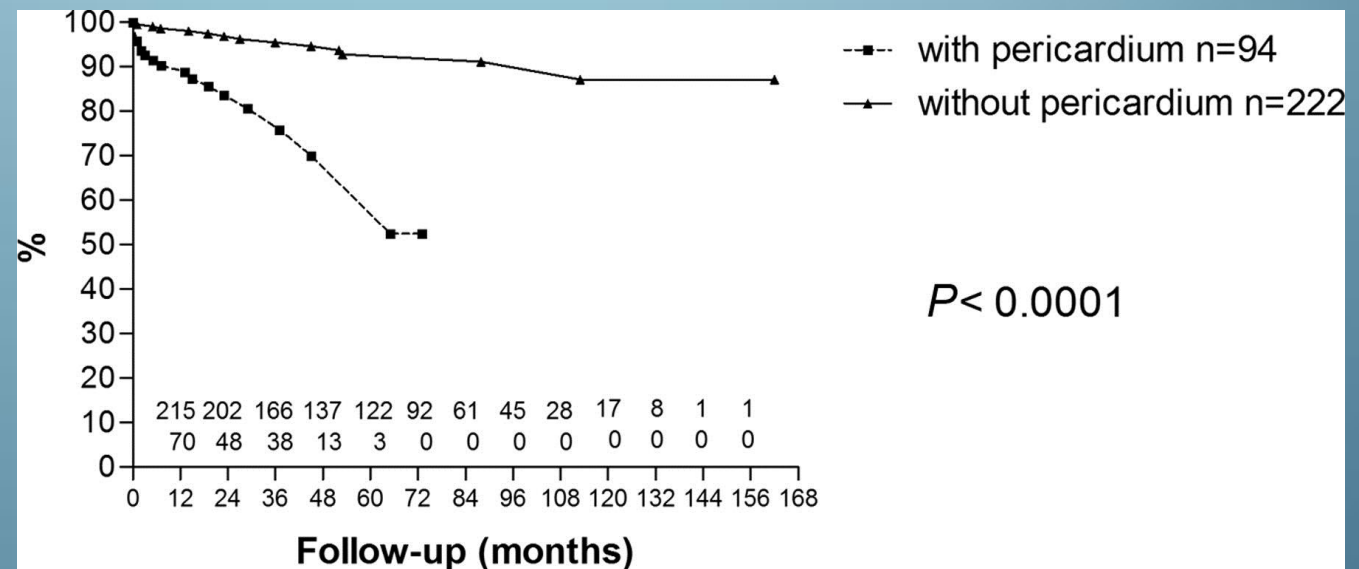
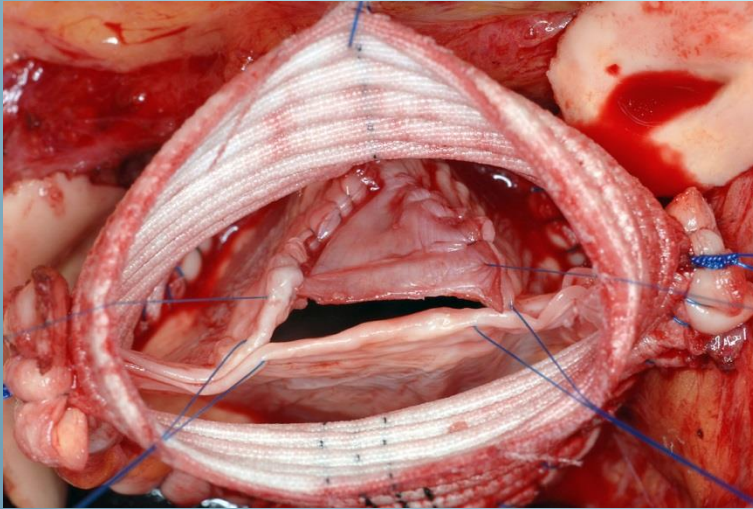
The Homburg Experience



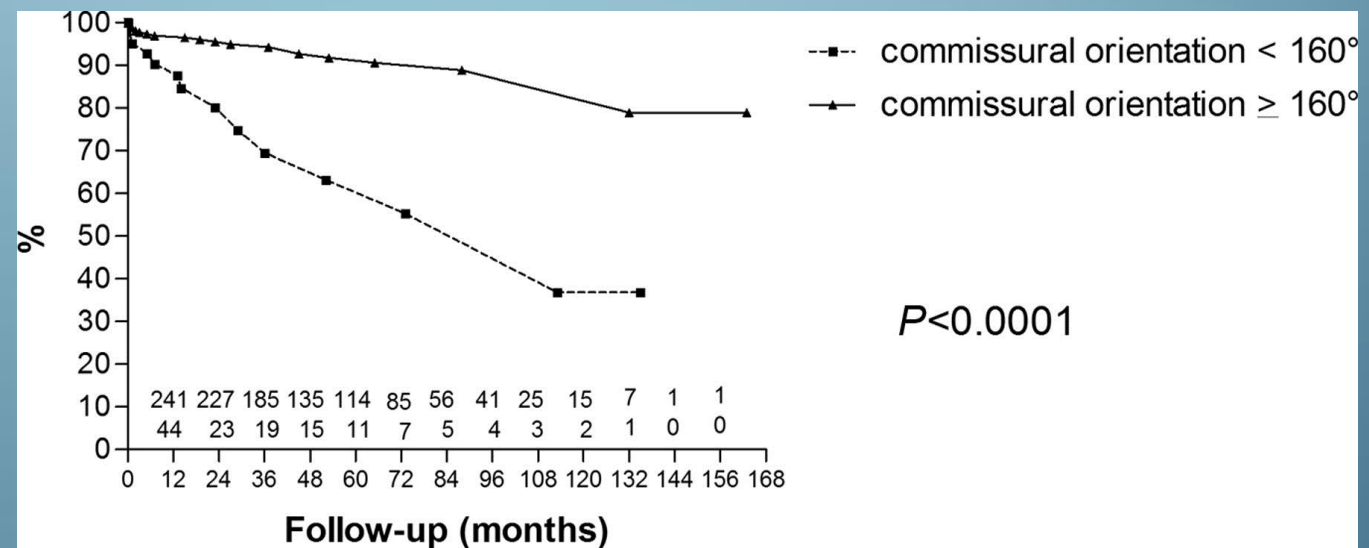
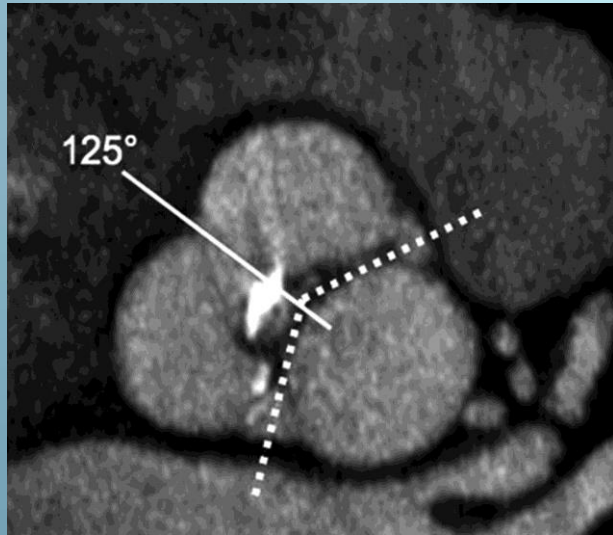
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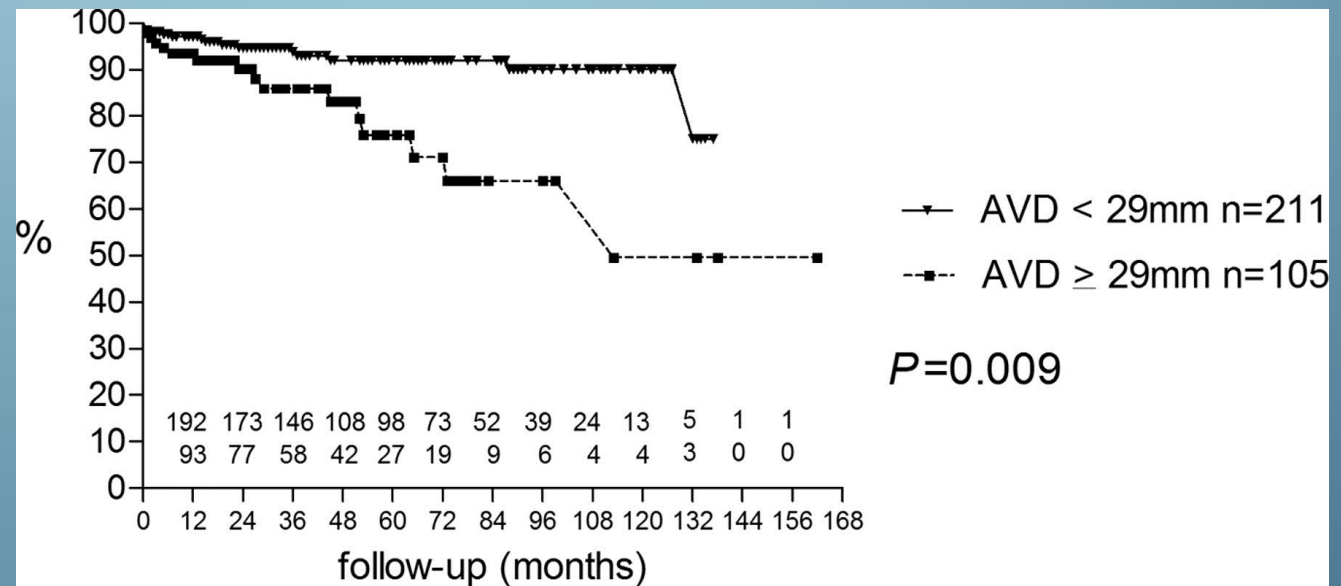
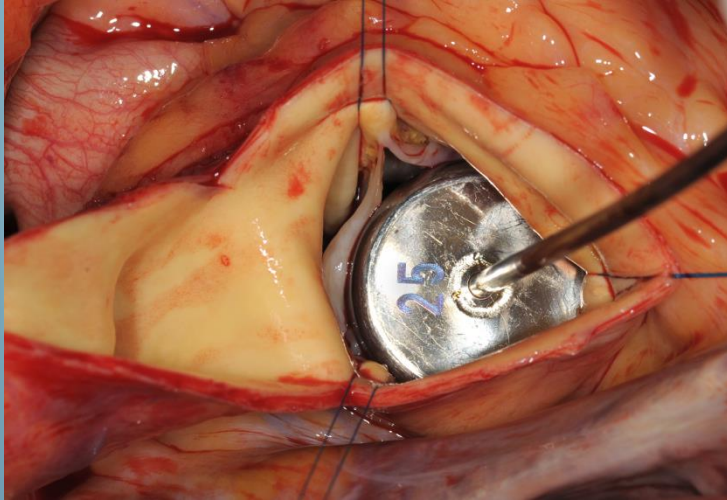
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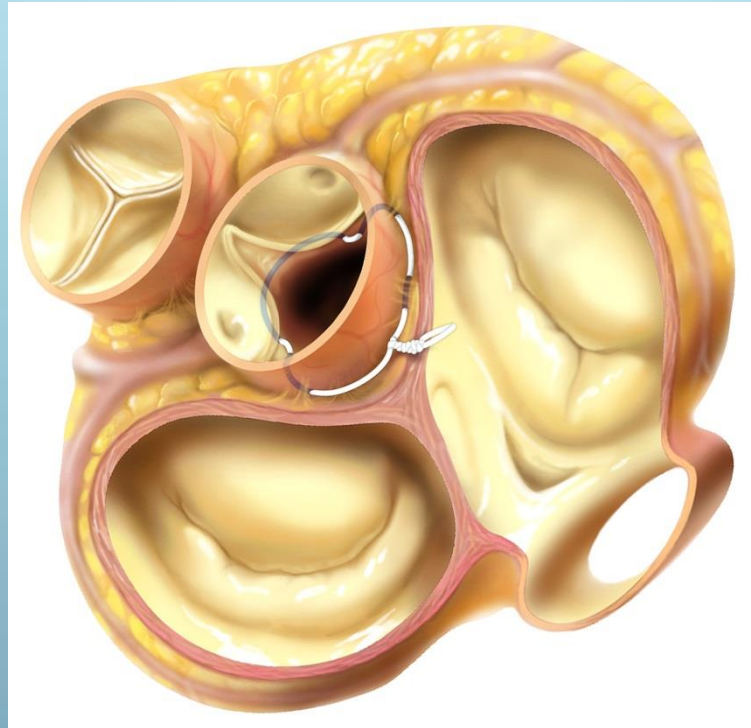
Valve Configuration Determines Long-Term Results After Repair of the Bicuspid Aortic Valve

Diana Aicher, Takashi Kuniyara, Omar Abou Issa, Brigitte Brittner, Stefan Gräber and
Hans-Joachim Schäfers

Risk factors for repair failure

- Subcoronary aortic stenosis
- Enlarged basal ring
- Unfavorable commissural orientation
- Use of a pericardial patch

2009: Suture Annuloplasty



Suture Annuloplasty in Aortic Valve Repair

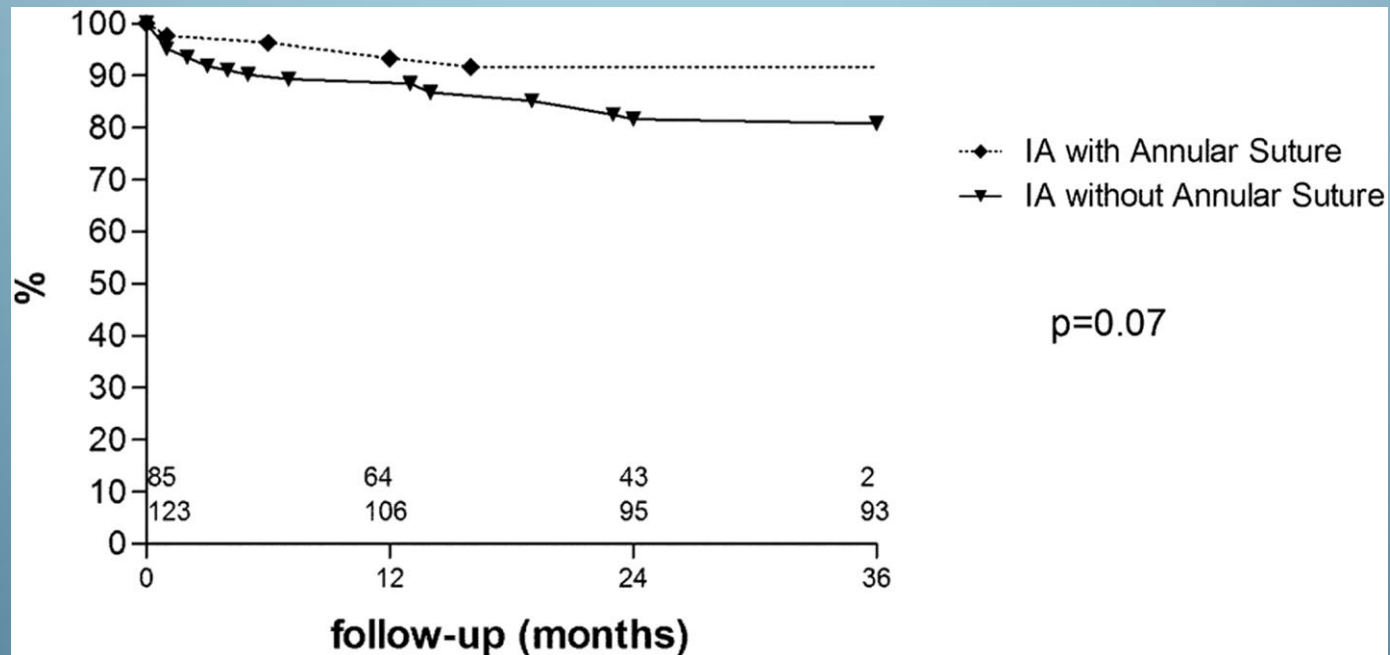
Ulrich Schneider, MD, Diana Aicher, MD, Yujiro Miura, MD, and
Hans-Joachim Schäfers, MD

Department of Thoracic and Cardiovascular Surgery, Saarland University Medical Center, Homburg, Saar, Germany

Suture Annuloplasty – Early Results

Early results with annular support in reconstruction of the bicuspid aortic valve

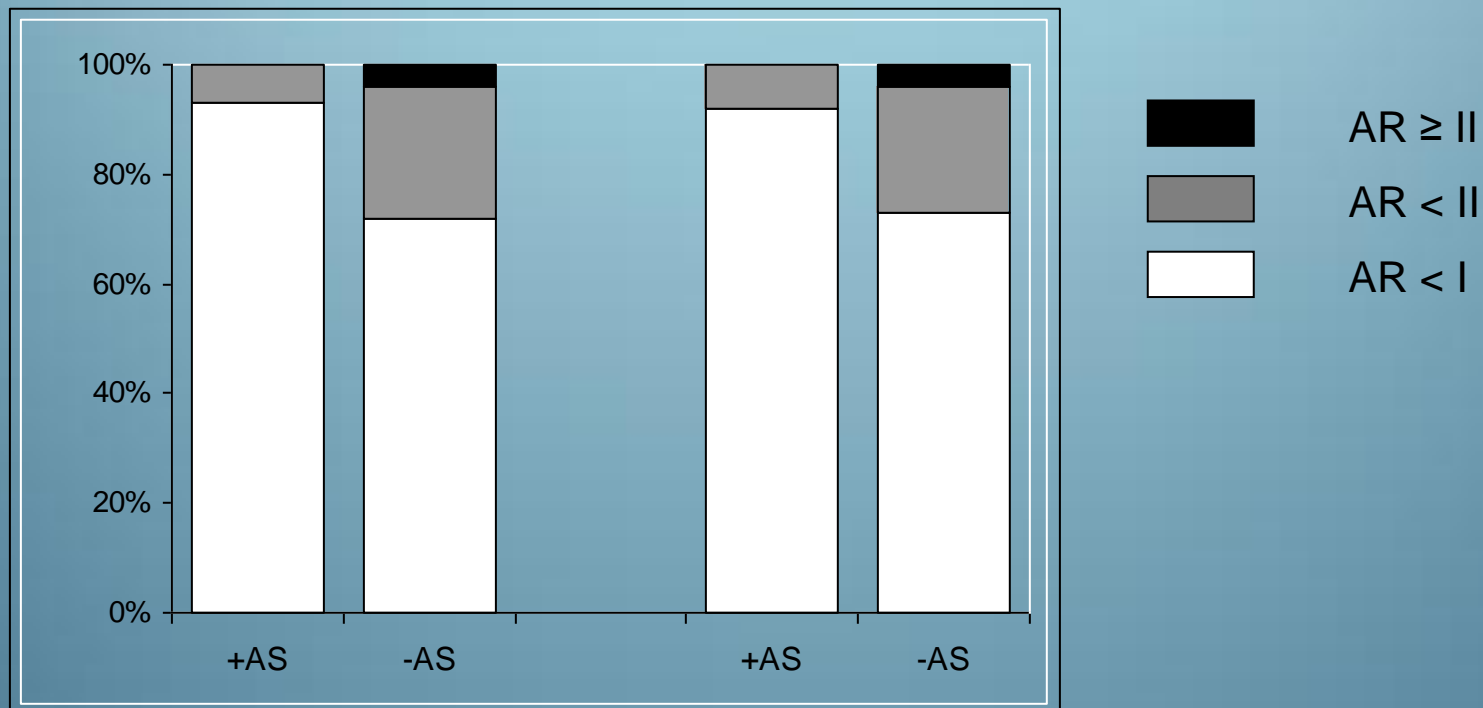
Diana Aicher, MD, Ulrich Schneider, Wolfram Schmied, Dipl Psych, Takashi Kuniyara, MD, Masato Tochii, MD, and Hans-Joachim Schäfers, MD, PhD



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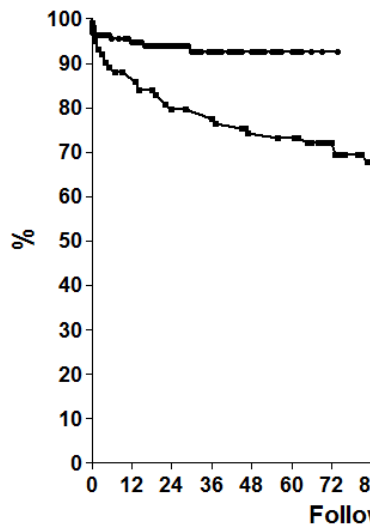
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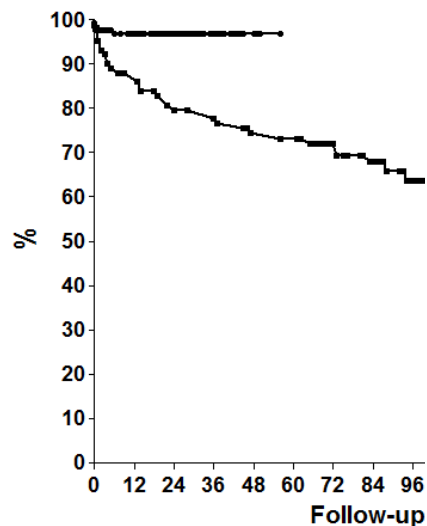
Suture Annuloplasty Significantly Improves the Durability of Bicuspid Aortic Valve Repair

Ulrich Schneider, MD, Christopher Hofmann, Diana Aicher, MD, Hiroaki Takahashi, MD, Yujiro Miura, MD, and Hans-Joachim Schäfers, MD

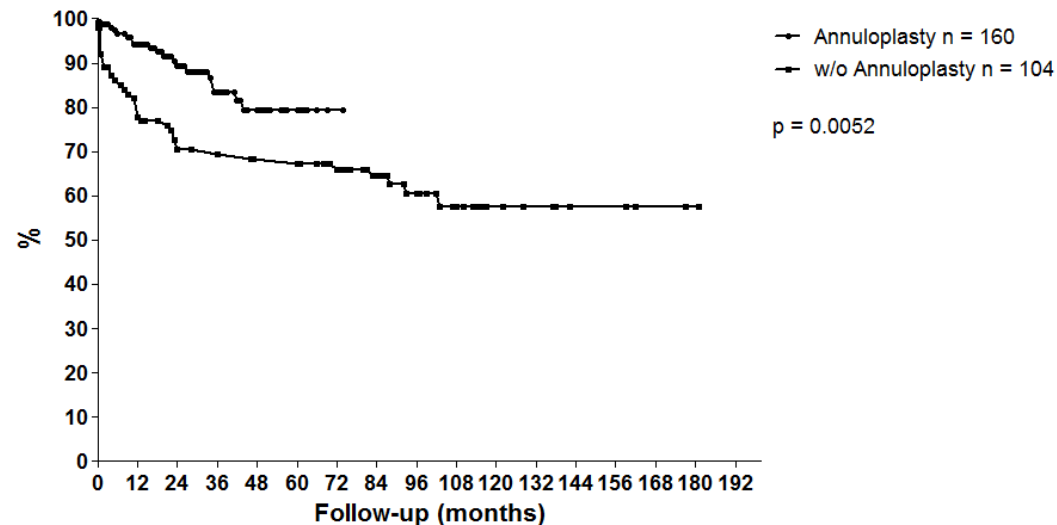
Freedom from Re-OP



Freedom from Re-OP



Freedom from AR \geq II



52nd Annual Meeting
Phoenix, Arizona
January 23–27, 2016



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Valve Configuration Determines Long-Term Results After Repair of the Bicuspid Aortic Valve

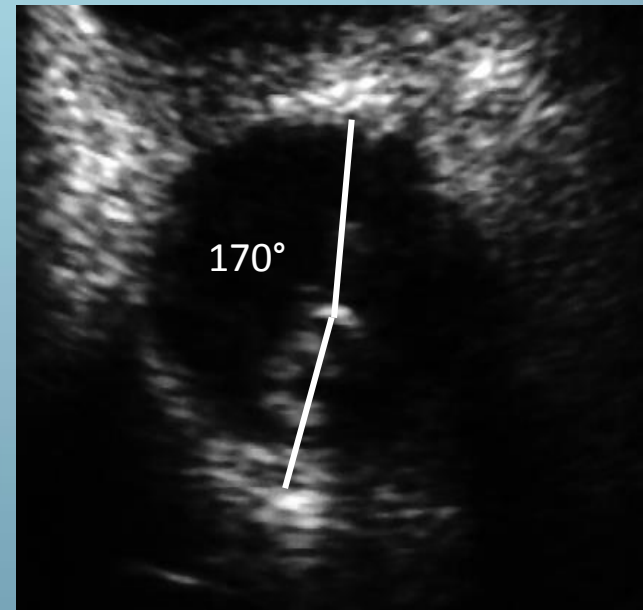
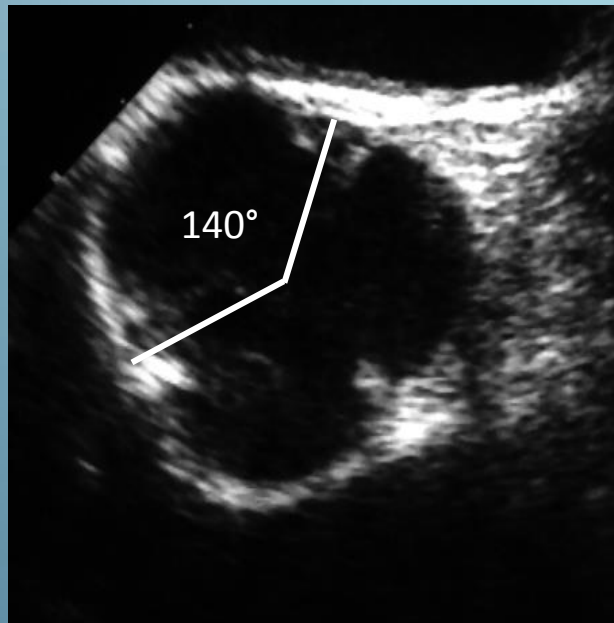
Diana Aicher, Takashi Kuniyara, Omar Abou Issa, Brigitte Brittner, Stefan Gräber and Hans-Joachim Schäfers

Risk factors for repair failure

- Subcoronary aortic communication
- Enlarged basal ring → **Suture Annuloplasty**
- Unfavorable commissural orientation
- Use of a pericardial patch

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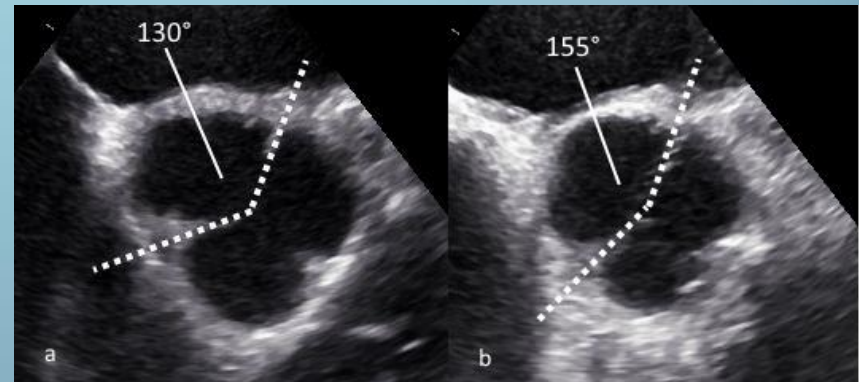
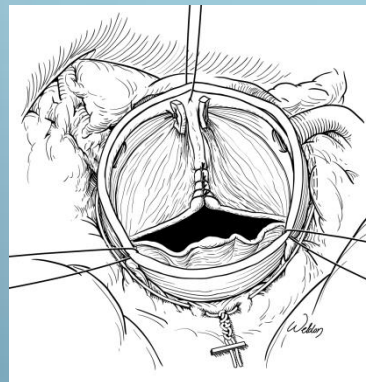
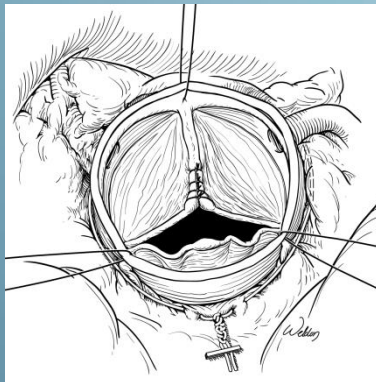
Commissural Orientation – Effect of Remodeling



Sinus Plication to Improve Valve Configuration in Bicuspid Aortic Valve Repair—Early Results

Ulrich Schneider, MD, Wolfram Schmied, Dipl-Psych, Diana Aicher, MD, Christian Giebels, MD, Lena Winter, MD, and Hans-Joachim Schäfers, MD

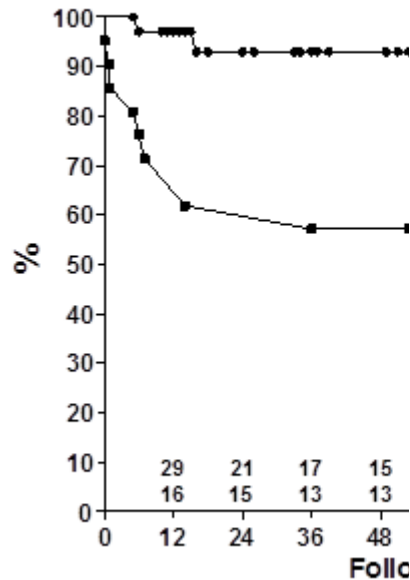
Hypothesis: Reducing the circumference of the fused sinuses should improve valve configuration.



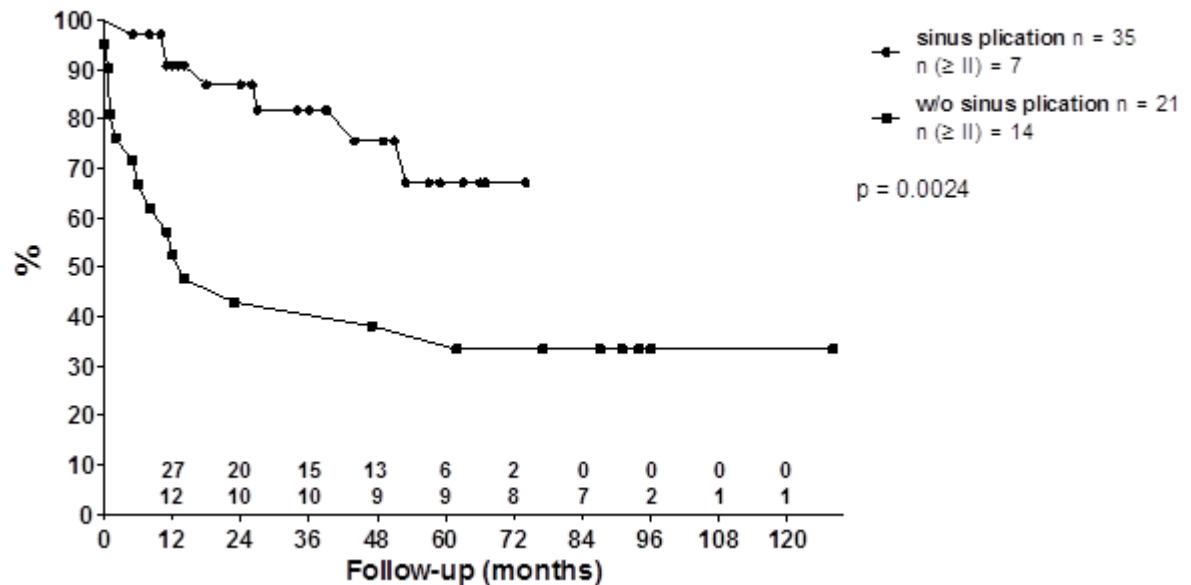
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Freedom from Re-OP



Freedom from AR \geq II



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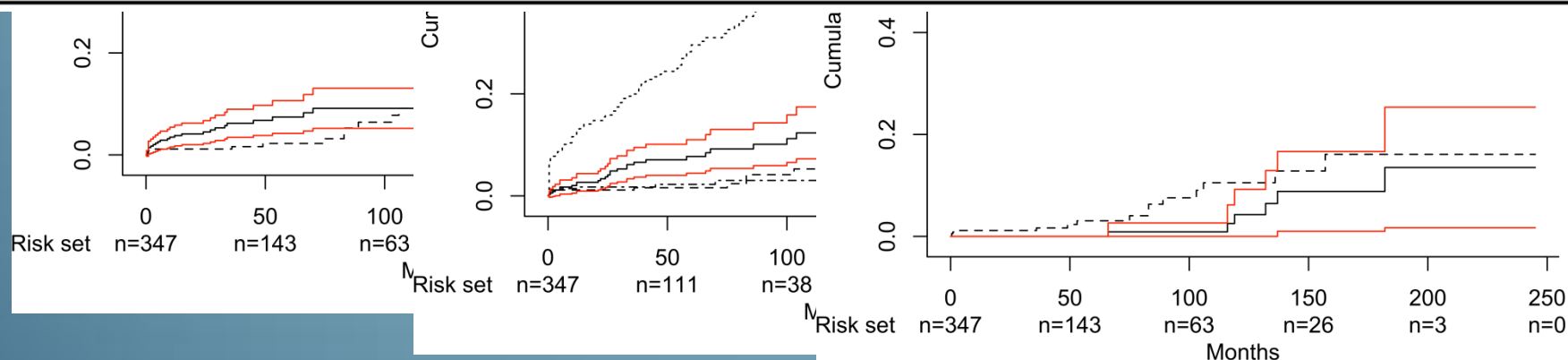
Risk factors for repair failure

- Subcoronary ~~calcification~~
- Enlarged basal ring → **Suture Annuloplasty**
- Unfavorable commissural orientation → **Remodeling/Sinus Plication**
- Use of a pericardial patch

Two decades of experience with root remodeling and valve repair for bicuspid aortic valves

Ulrich Schneider, MD,^a Susanne K. Feldner, MD,^a Christopher Hofmann,^a Jakob Schöpe, MSc,^b Stefan Wagenpfeil, PhD,^b Christian Giebels, MD,^a and Hans-Joachim Schäfers, MD^a

	Crude model			Adjusted model		
	Subdistributional HR	P value	95% CI	Subdistributional HR	P value	95% CI
Effective height measurement†	1.62	.240	0.73-3.63	1.23	.680	0.46-3.27
Aneurysm‡	0.49	.083	0.22-1.10	0.53	.130	0.24-1.20
Graft size§ (24 mm)	1.14	.760	0.49-2.65	1.22	.670	0.49-3.03
Graft size§ (28 mm)	1.58	.480	0.44-5.72	1.34	.690	0.32-5.65
Degree of fusion	0.59	.220	0.25-1.39	0.38	.034	0.15-0.93
Calcification¶	2.31	.030	1.08-4.94	4.34	.002	1.69-11.16
Pericardial Patch#	5.17	<.001	2.28-11.7	4.00	.002	1.65-9.66
Annuloplasty**	1.55	.300	0.68-3.52	1.21	.680	0.49-2.97



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Valve Configuration Determines Long-Term Results After Repair of the Bicuspid Aortic Valve

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Risk factors for repair failure

- Subcommissural calcification
- Enlarged basal ring → **Suture Annuloplasty**
- Unfavorable commissural orientation → **Sinus Plication/Remodeling**
- Use of a pericardial patch ???

Conclusion

- Repair of the regurgitant BAV in combination with or without aortic replacement is a reproducible treatment of AR and aortic dilatation.
- Good stability for up to 20 years can be achieved in the majority of patients.
- Development of relevant AS is rare over 15 years; cusp calcium at the time of surgery implies an increased probability of stenosis > 10 years.
- The need for partial cusp replacement using pericardium remains the strongest predictor of failure.

→ patient selection?

Thank you!