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Reconstruction of the Aortic Valve and Root
A Practical approach

Why and when to repair the aortic valve

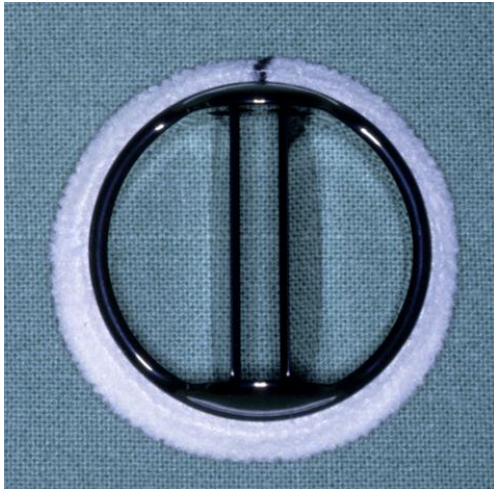
Diana Aicher



September 16th - 18th 2015

Why repair the aortic valve ?

Aortic Valve Replacement



Valve-related Complications:

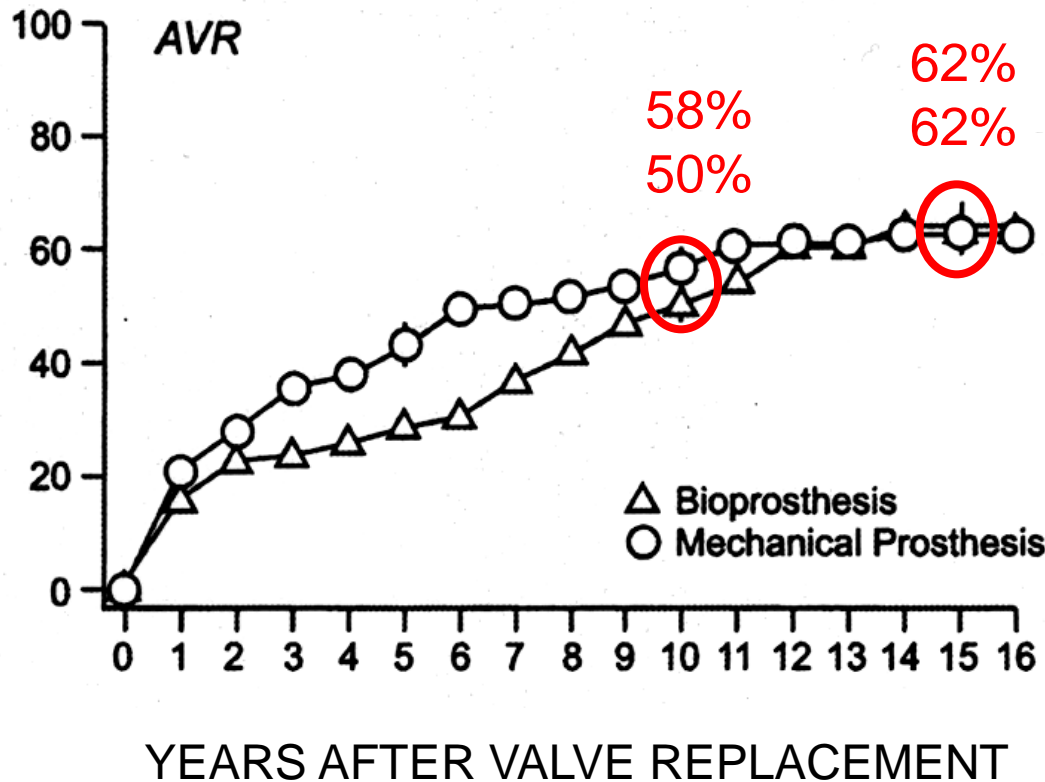
Bleeding
Thromboembolism
Endocarditis
Valve degeneration

Why and when to repair the aortic valve

Outcomes 15 Years After Valve Replacement With a Mechanical Versus a Bioprosthetic Valve: Final Report of the Veterans Affairs Randomized Trial

Karl Hammermeister, MD, FACC,* Gulshan K. Sethi, MD, FACC,† William G. Henderson, PhD,‡
Frederick L. Grover, MD, FACC,* Charles Oprian, PhD,‡
Shahbudin H. Rahimtoola, MB, FRCP, MACP, MACC§

ALL VALVE RELATED COMPLICATIONS %
Bleeding/endocarditis/systemic embolism/nonthrombotic valve
obstruction/valvular regurgitation/ valv thrombosis

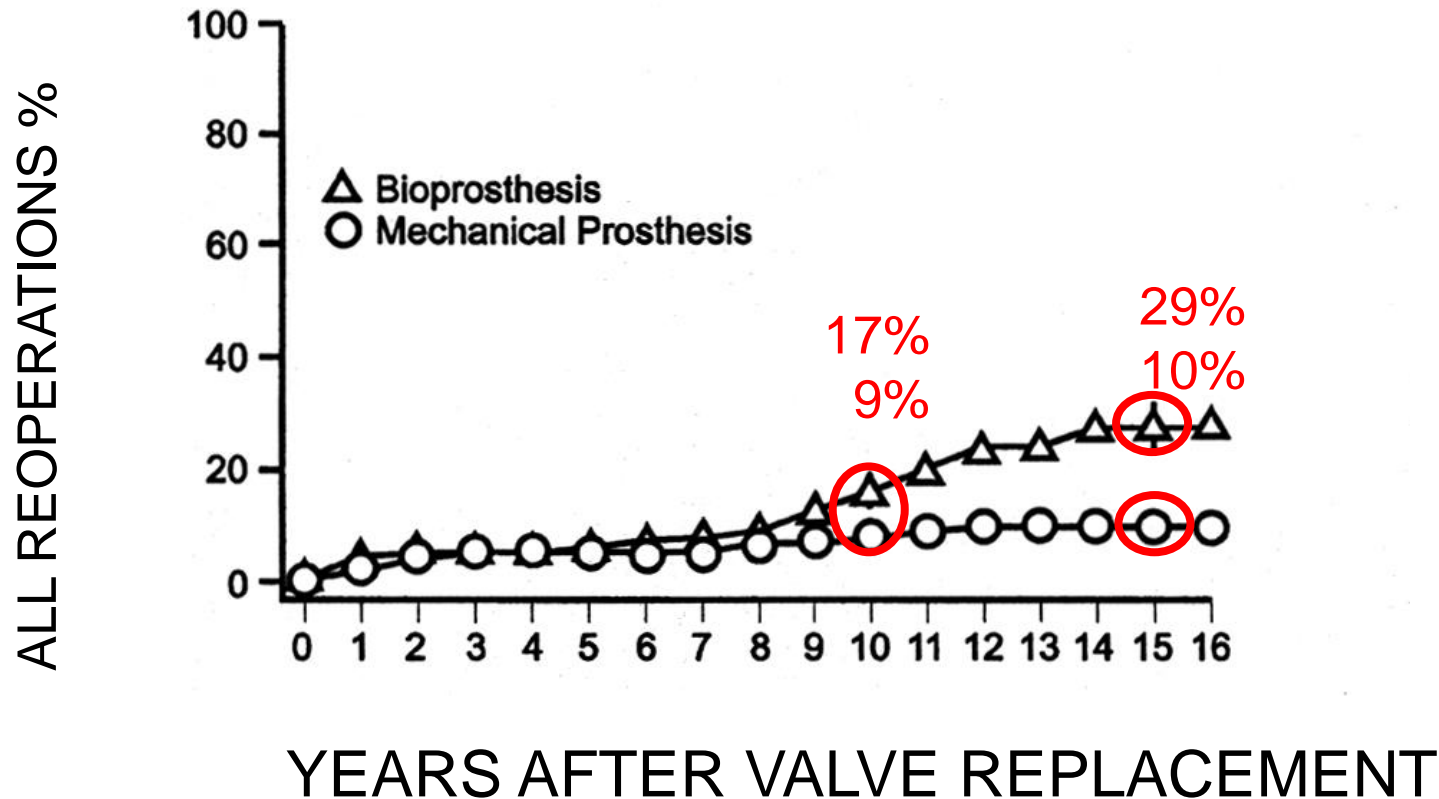


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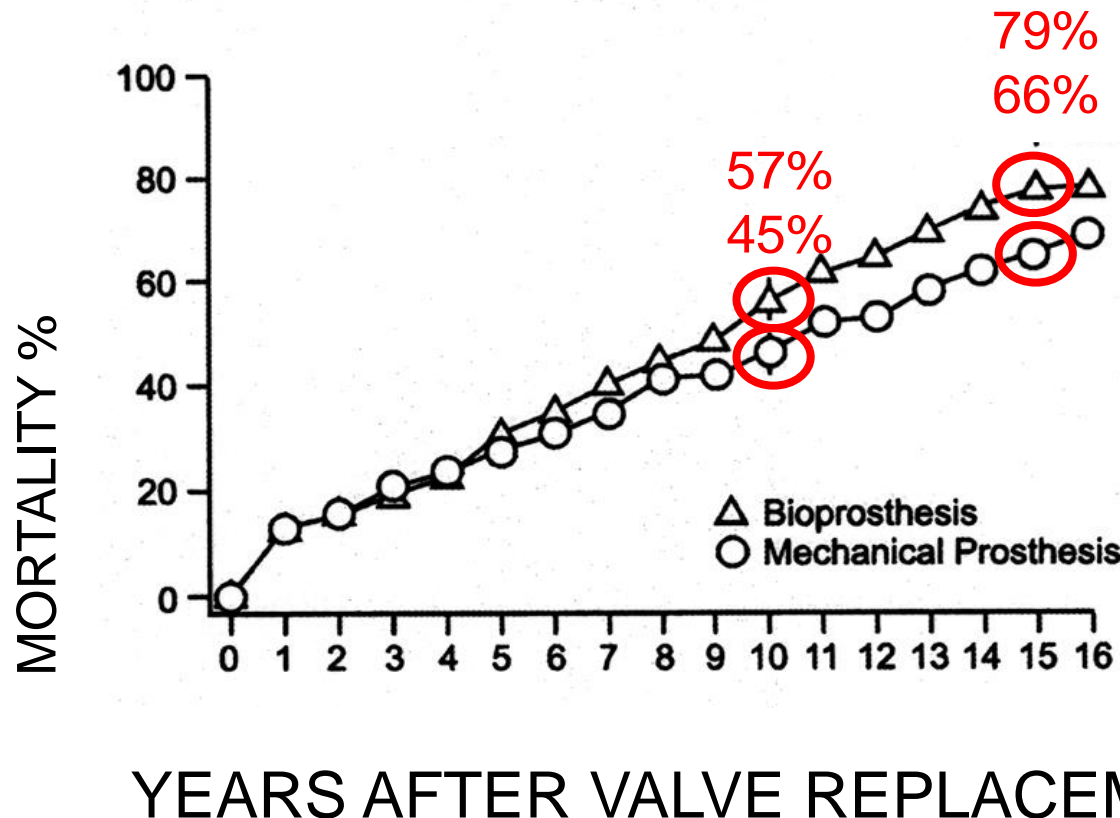


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Why and when to repair the aortic valve

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p=0.02

prosthesis-related death
mechanical 37%
biological 41%

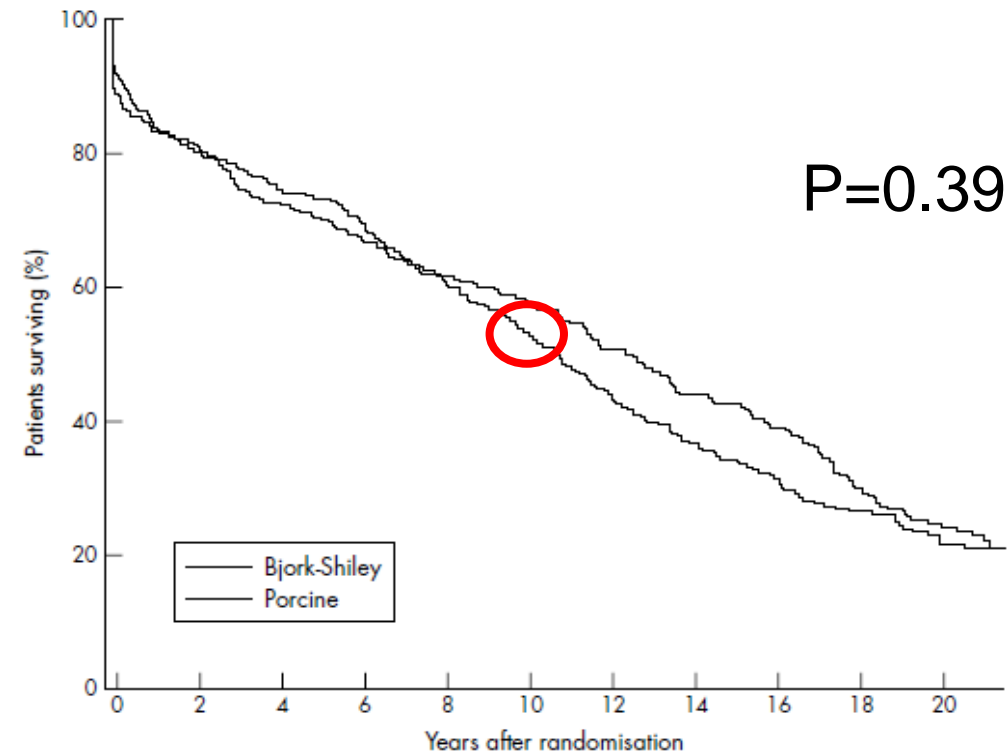
Why and when to repair the aortic valve

Twenty year comparison of a Bjork-Shiley mechanical heart valve with porcine bioprostheses

H Oxenham, P Bloomfield, D J Wheatley, R J Lee, J Cunningham, R J Prescott, H C Miller

	Aortic valve replacement		
	10 Years	20 Years	p Value*
Survival			
All survivors			
Bjork-Shiley valve	64.0 (4.6)	28.4 (4.4)	0.57
Porcine valve	65.7 (4.7)	31.3 (4.7)	
Survivors with original prosthesis intact			
Bjork-Shiley valve	63.1 (4.6)	27.5 (4.3)	0.025
Porcine valve	58.8 (4.9)	13.7 (3.6)	
Survivors without a major event			
Bjork-Shiley valve	53.8 (4.8)	15.2 (3.5)	0.34
Porcine valve	52.0 (5.0)	8.1 (3.0)	
Valve related events			
Reoperation			
Bjork-Shiley valve	4.2 (2.1)	7.4 (3.0)	<0.0001
Porcine valve	11.3 (3.6)	56.2 (8.4)	
Bleeding: all episodes			
Bjork-Shiley valve	16.3 (4.2)	61.1 (7.6)	0.001
Porcine valve	5.9 (2.9)	42.4 (12.1)	
Bleeding: major episodes			
Bjork-Shiley valve	12.2 (3.7)	37.8 (7.1)	0.021
Porcine valve	4.2 (2.4)	32.0 (12.6)	
Embolism: all episodes			
Bjork-Shiley valve	9.8 (3.2)	24.0 (6.2)	0.13
Porcine valve	22.6 (4.9)	39.2 (8.8)	
Embolism: major episodes			
Bjork-Shiley valve	2.0 (1.4)	10.3 (4.9)	0.26
Porcine valve	8.9 (3.3)	15.4 (7.0)	
Endocarditis			
Bjork-Shiley valve	4.8 (2.4)	8.3 (4.1)	0.71
Porcine valve	2.2 (1.6)	8.7 (6.5)	

Survival

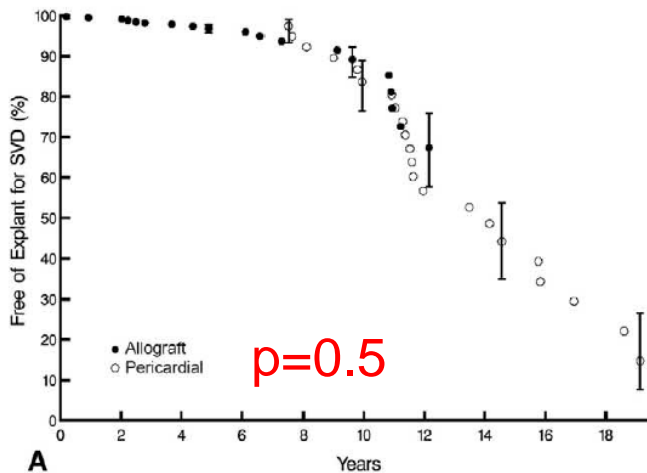


Bjork-Shiley	267	218	196	181	167	156	137	119	106	82	46
Porcine	266	216	201	188	161	140	114	97	83	70	38

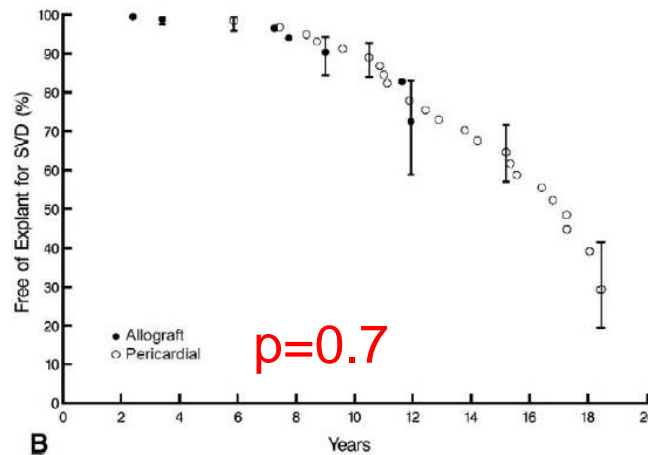
Are allografts the biologic valve of choice for aortic valve replacement in nonelderly patients? Comparison of explantation for structural valve deterioration of allograft and pericardial prostheses

Nicholas G. Smedira, MD,^a Eugene H. Blackstone, MD,^{a,b} Eric E. Roselli, MD,^a Colleen C. Laffey, RN,^a and Delos M. Cosgrove, MD^a

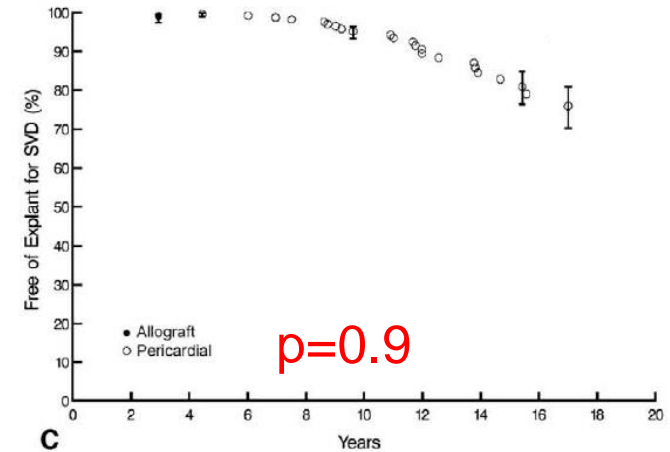
Age \leq 50



Age: 50 - 60



Age > 60



Why and when to repair the aortic valve

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Durability of Pericardial Versus Porcine Aortic Valves

Guangqiang Gao, MD, YingXing Wu, MD, Gary L. Grunkemeier, PhD, Anthony P. Furnary, MD, Albert Starr, MD
Portland, Oregon

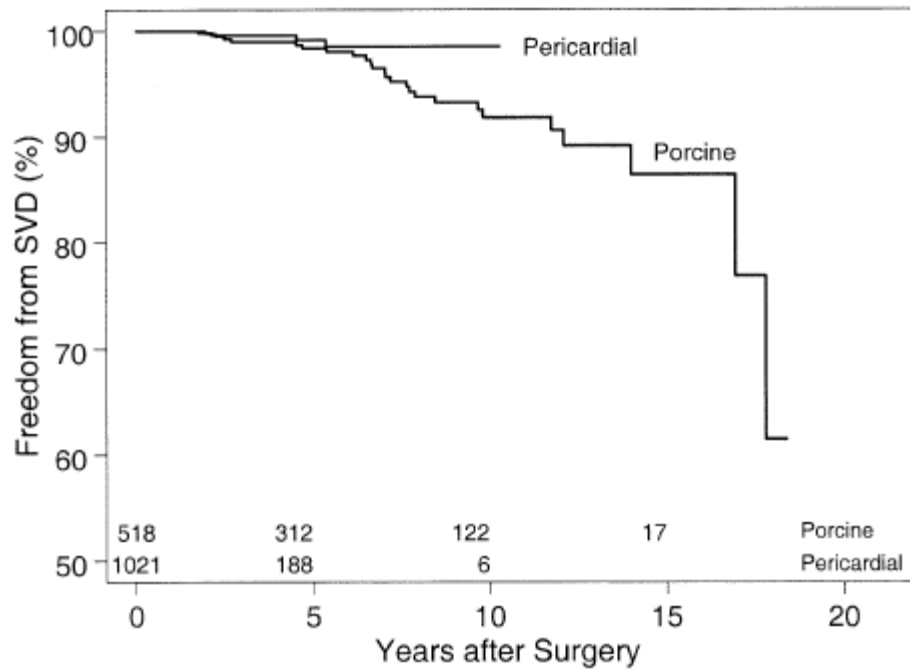


Figure 5. Freedom from structural valve deterioration (SVD) for porcine and pericardial aortic valve replacement patients.

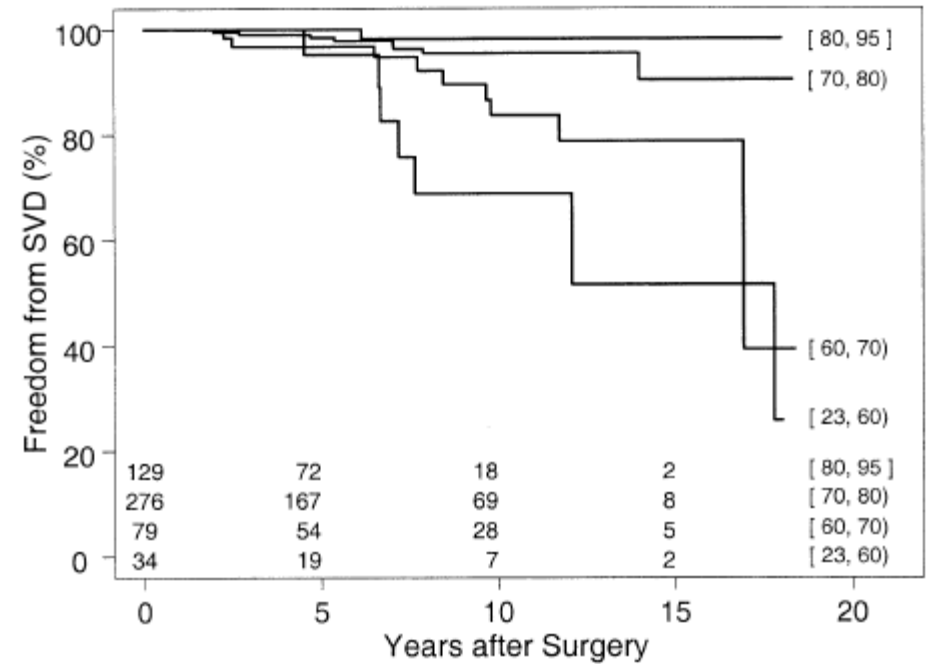
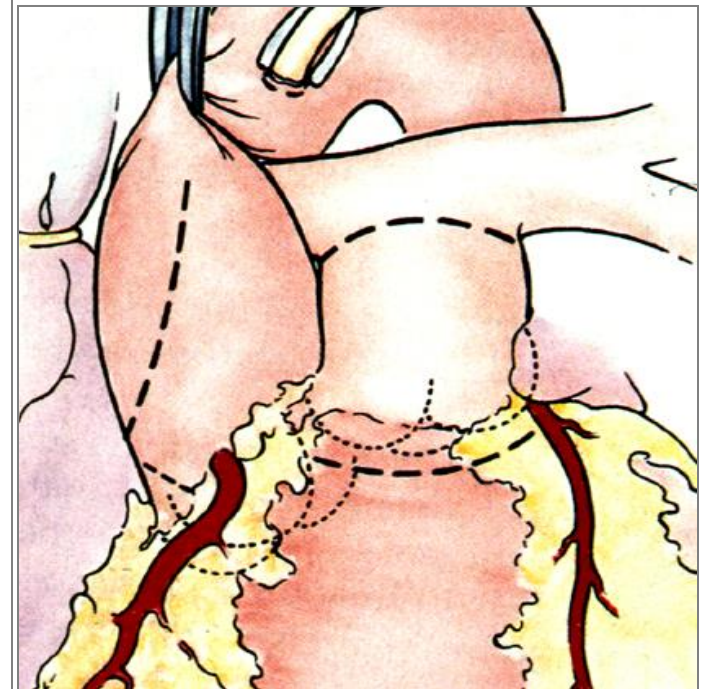
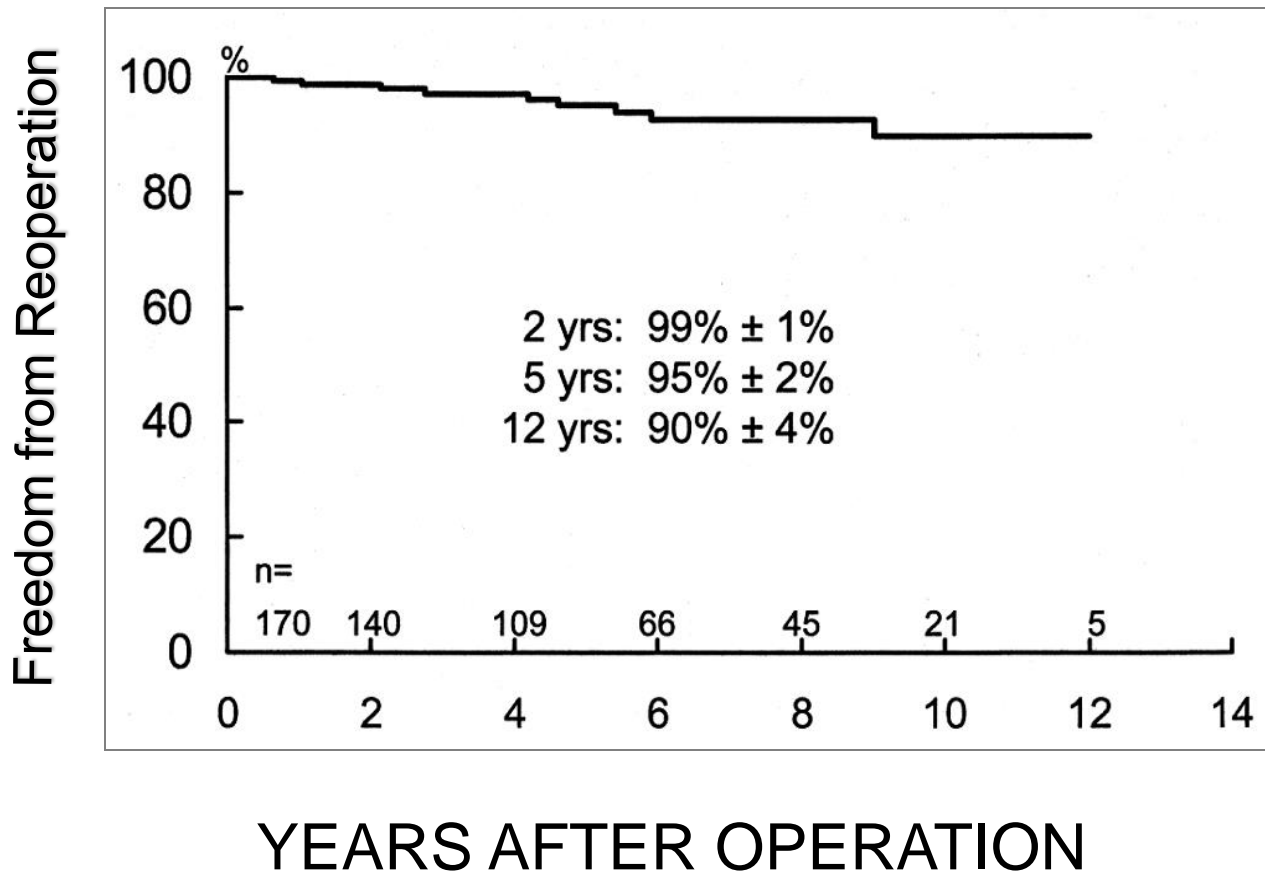


Figure 6. Freedom from structural valve deterioration (SVD) for porcine aortic valve replacement patients in different age groups.

The ROSS Procedure



Why and when to repair the aortic valve

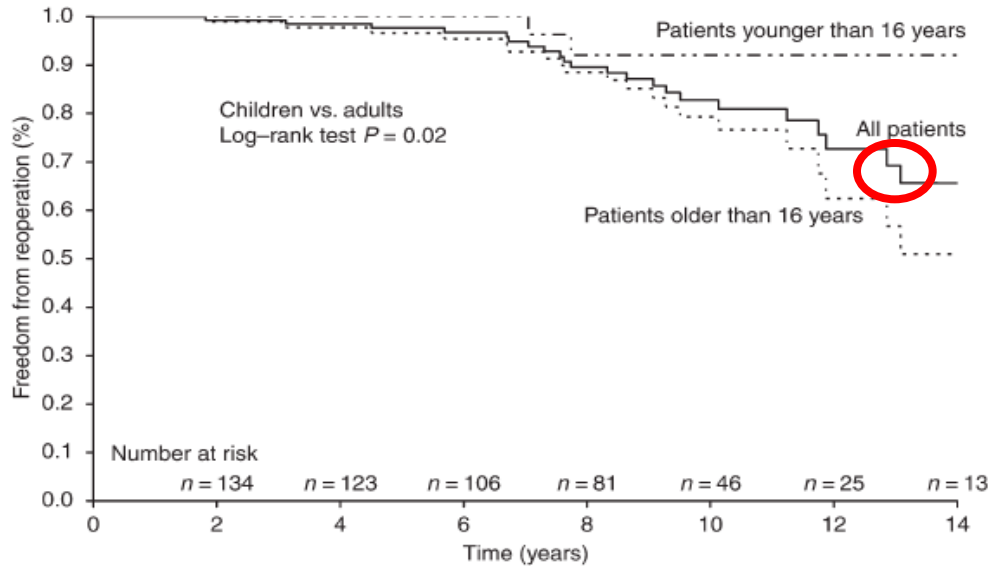


European Heart Journal (2007) 28, 1993–2000
doi:10.1093/eurheartj/ehl550

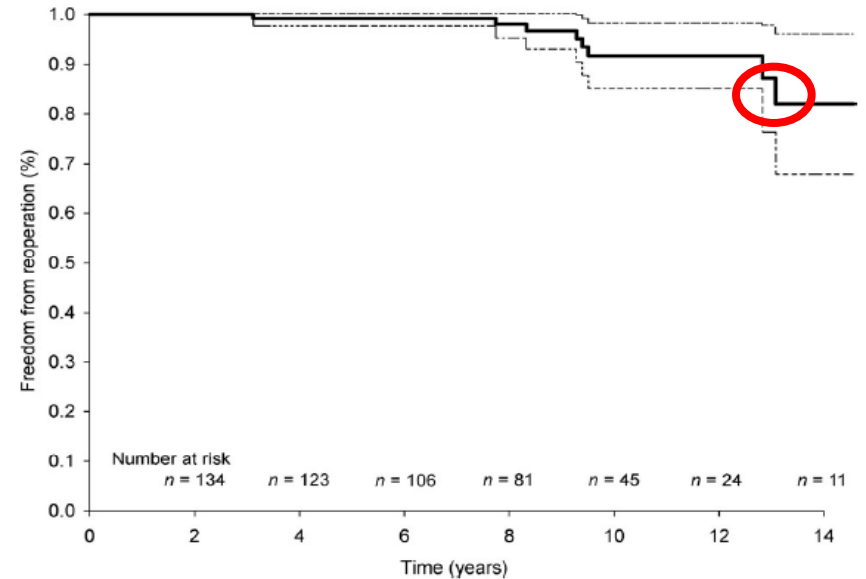
Clinical research
Congenital heart disease

The Ross operation: a Trojan horse?†

Loes M.A. Klieverik^{1*}, Johanna J.M. Takkenberg¹, Jos A. Bekkers¹, Jolien W. Roos-Hesselink², Maarten Witsenburg³, and Ad J.J.C. Bogers¹



FREEDOM FROM
AUTOGRAFT REOPERATION

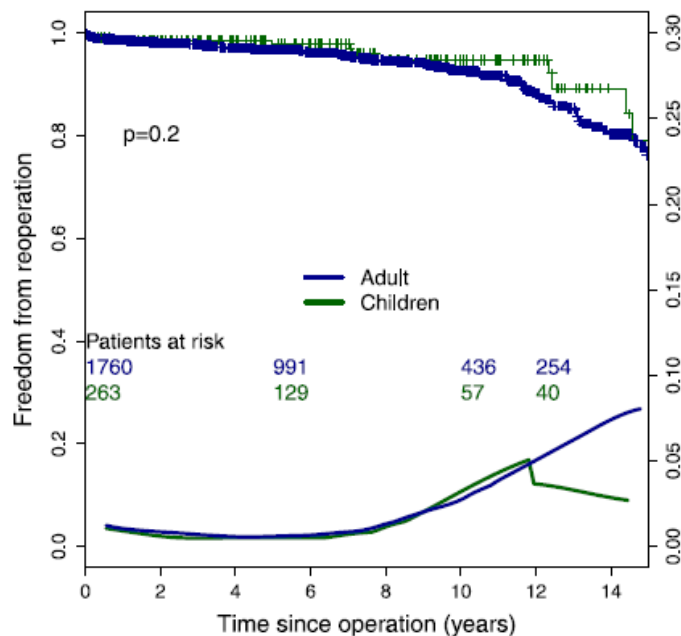


FREEDOM FROM PULMONARY
ALLOGRAFT REOPERATION

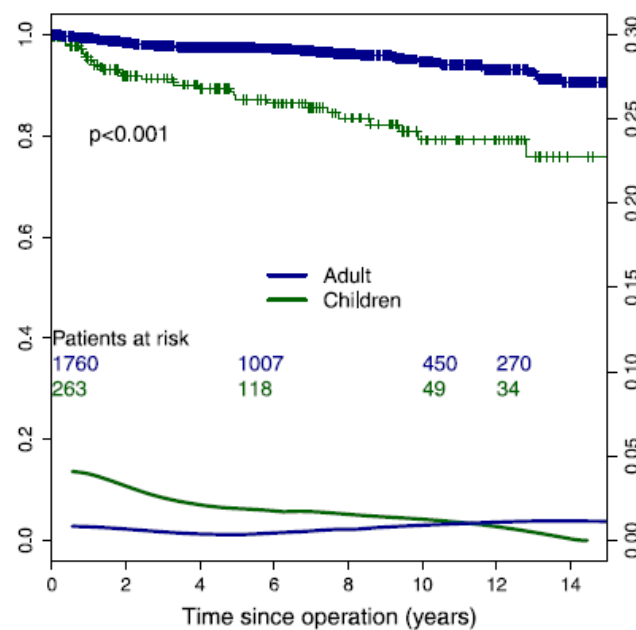
Reoperations on the pulmonary autograft and pulmonary homograft after the Ross procedure: An update on the German Dutch Ross Registry

Efstratios I. Charitos, MD,^a Johanna J. M. Takkenberg, MD,^b Thorsten Hanke, MD,^a Armin Gorski, MD,^c Cornelius Botha, MD,^d Ulrich Franke, MD,^e Ali Dodge-Khatami, MD,^f Juergen Hoerer, MD,^g Rudiger Lange, MD,^g Anton Moritz, MD,^h Katharina Ferrari-Kuehne, MD,ⁱ Roland Hetzer, MD,^j Michael Huebler, MD,^j Ad J. J. C. Bogers, MD,^b Ulrich Stierle, MD,^a Hans-Hinrich Sievers, MD,^a and Wolfgang Hemmer, MD^k

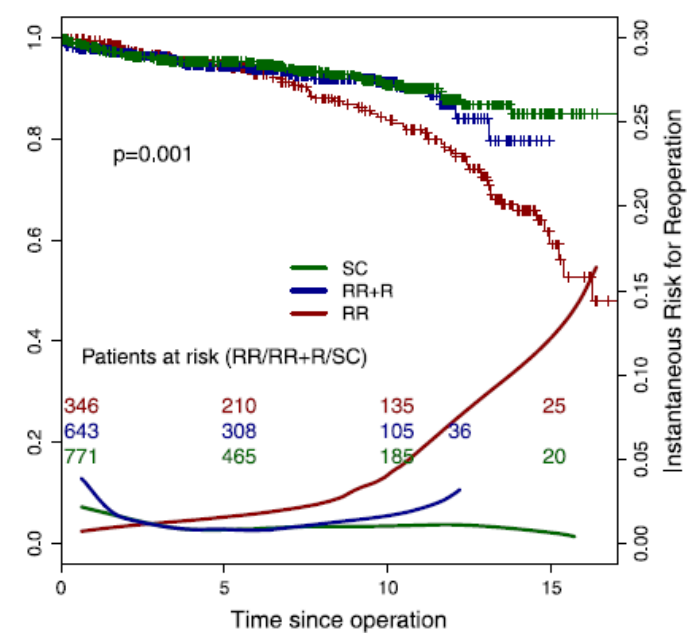
Freedom from Autograft Reoperation



Freedom from Homograft Reoperation



Freedom from Reoperation (Adults)

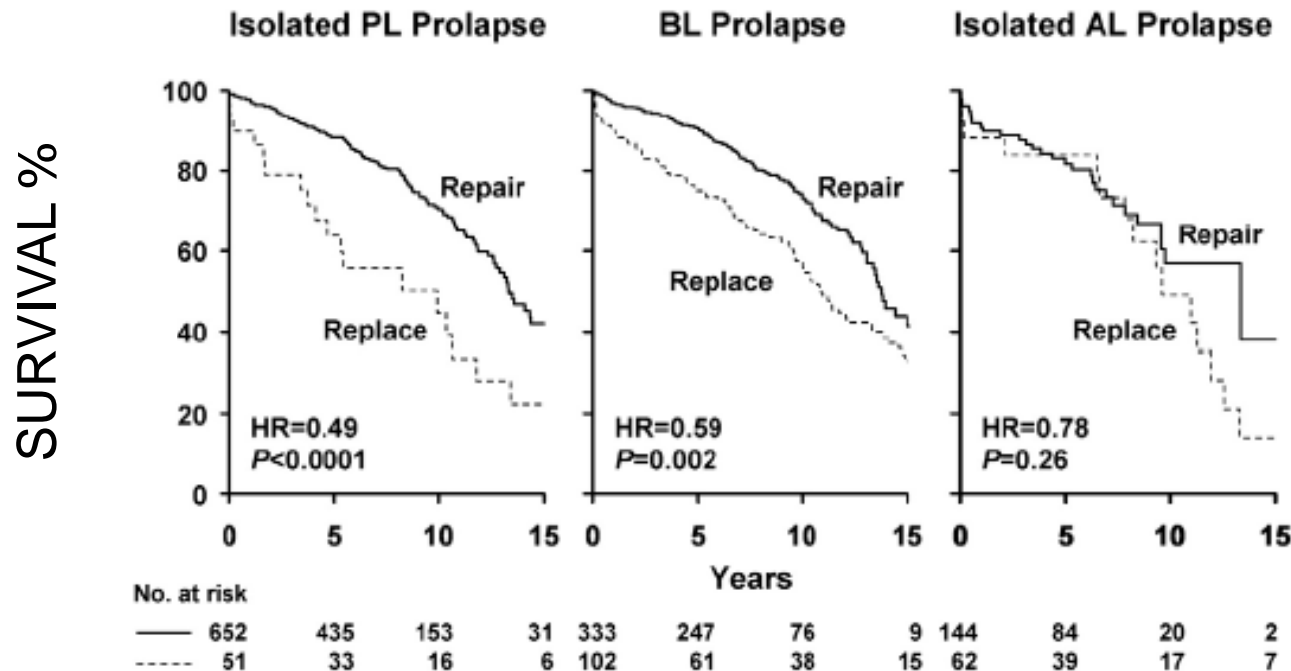


Mitral Valve Surgery

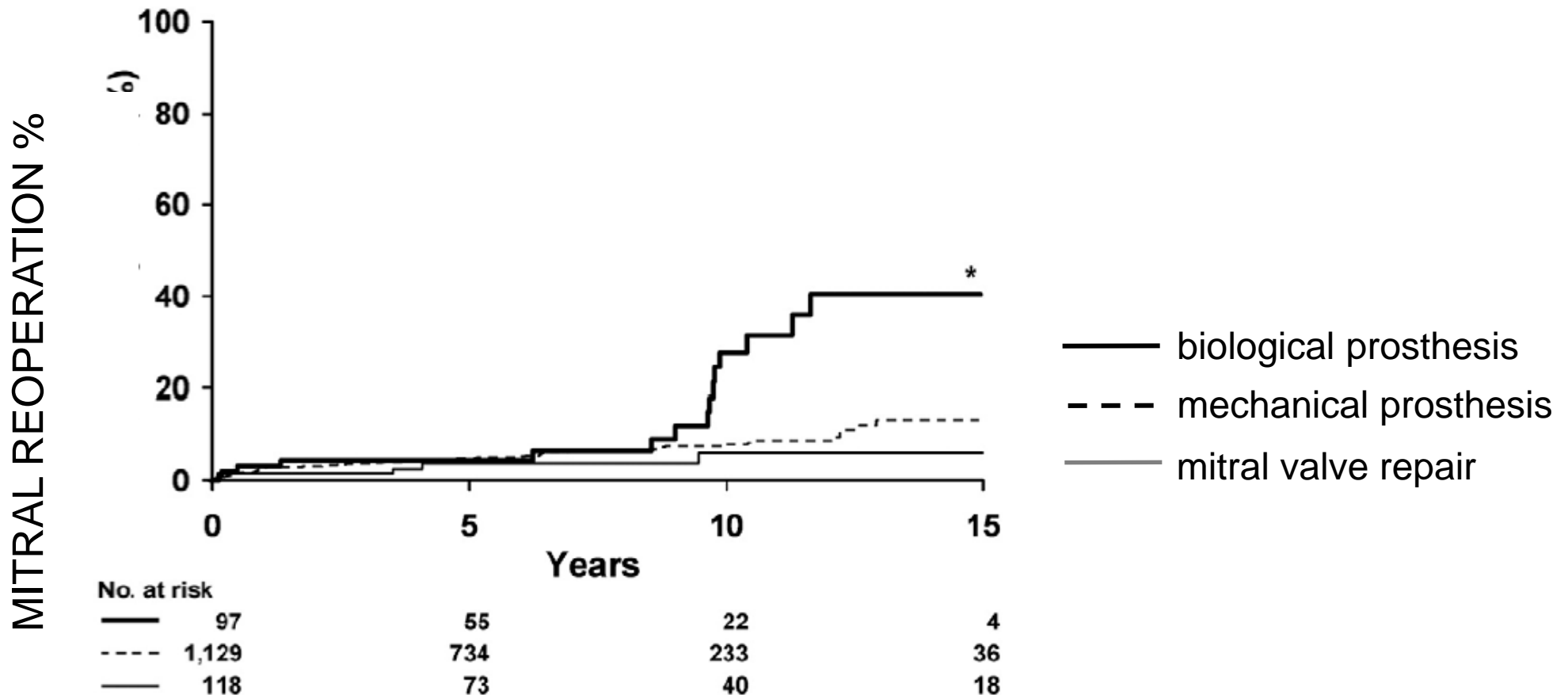
Survival Advantage and Improved Durability of Mitral Repair for Leaflet Prolapse Subsets in the Current Era

Rakesh M. Suri, MD, DPhil, Hartzell V. Schaff, MD, Joseph A. Dearani, MD, Thoralf M. Sundt III, MD, Richard C. Daly, MD, Charles J. Mullany, MB, MS, Maurice Enriquez-Sarano, MD, and Thomas A. Orszulak, MD

Division of Cardiovascular Surgery, Mayo Clinic College of Medicine, Rochester, Minnesota



Mitral Valve Surgery





Results of Aortic Valve Repair (Homburg)

Patients 10/95- 1/2015: n=2073

• Hospital mortality	35 (1.7%)
• AV-Block	10 (0.5%)
• Neurologic events	
• early	15 (0.7%)
• late (thrombembolic)	17 (0.3%/pt year)
• Endocarditis	16 (0.25%/pt year)
• Reoperations	155 (7.5%)

Mean Follow-up: 5.7 ± 3.5 years [1-231 months]



Why and when to repair the aortic valve



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Aortic valve repair leads to a low incidence of valve-related complications

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Frank Langer^a, Hans-Joachim Schäfers^{a,*}

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Abstract

Objective: Aortic valve replacement for aortic regurgitation leads to a high incidence of valve-related complications. Aortic valve repair is an alternative approach. In a retrospective study over a 10-year period, 640 patients underwent aortic valve repair for regurgitation of the aortic valve ($n = 3$) aortic valve. The mechanism of regurgitation included bicuspid aortic valve ($n = 323$) or combined pathologies. Treatment consisted of aortic valve repair or replacement. All patients were followed clinically and echocardiographically. **Results:** Hospital mortality was 3.4% in the total patient population. Postoperative mortality was 0.2% per patient per year and endocarditis (0.16% per patient per year) in bicuspid and 97% and 93% in tricuspid aortic valves ($p < 0.001$). Freedom from valve-related complications after valve repair was 95% and 90% in bicuspid and 97% and 94% in tricuspid aortic valves at 1 and 10 years, respectively. **Conclusions:** Reconstructive surgery of the aortic valve leads to a low incidence of valve-related complications. Freedom from valve-related complications after valve repair was 88%. **© 2009 European Association for Cardio-Thoracic Surgery.**

Freedom from all valve-related complications at 10 years was 88%.

Freedom from valve-related complications after valve repair seems superior compared to available data on standard aortic valve replacement.

Quality of life after aortic valve surgery: Replacement versus reconstruction

Diana Aicher, MD,^a Annika Holz,^a Susanne Feldner, MD,^a Volker Köllner, MD,^b and Hans-Joachim Schäfers, MD^a

Objective: Quality of life has been shown to be influenced by aortic valve replacement, particularly in younger patients. Aortic valve repair is a recent alternative to replacement. We investigated quality of life and anxiety and depression after aortic valve repair and compared with 2 established replacement alternatives, mechanical valve and pulmonary autograft.

Methods: In a cross-sectional study, 166 patients (age, 18–45 years) were studied after isolated elective aortic

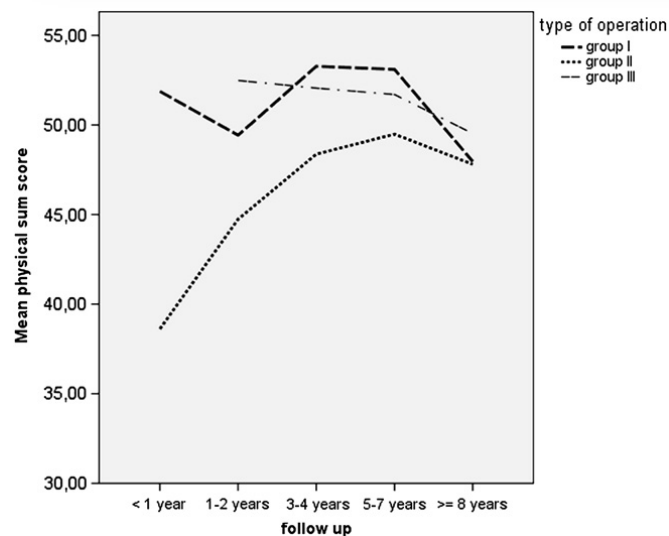


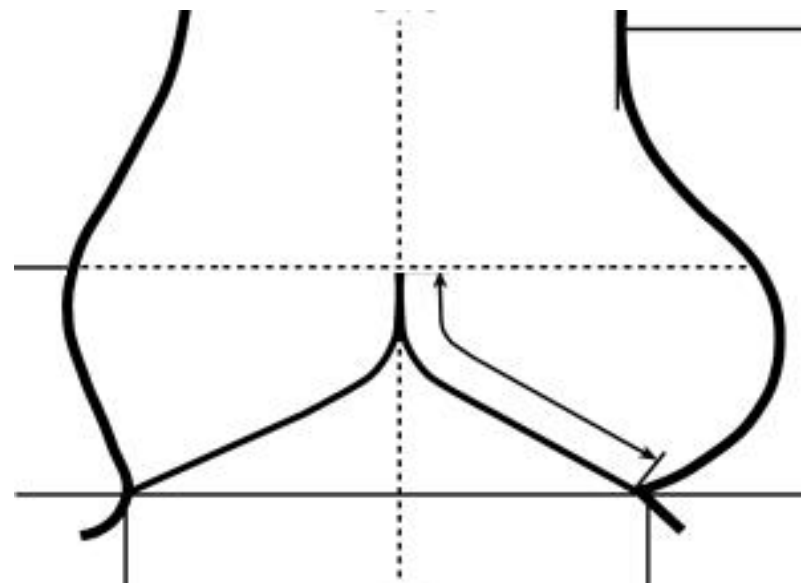
FIGURE 1. Mean physical sum scores at follow-up in patients with valve repair (group I), patients after mechanical aortic valve replacement (group II), and patients after the Ross procedure (group III).

The absence of anticoagulation and the low incidence of valve-related complications after repair results in a higher quality of life.

When to repair the aortic valve ?

Preservation of an aortic valve

- Absence of calcification/valve stenosis
- Aortic regurgitation
- Aortic/Root dilatation

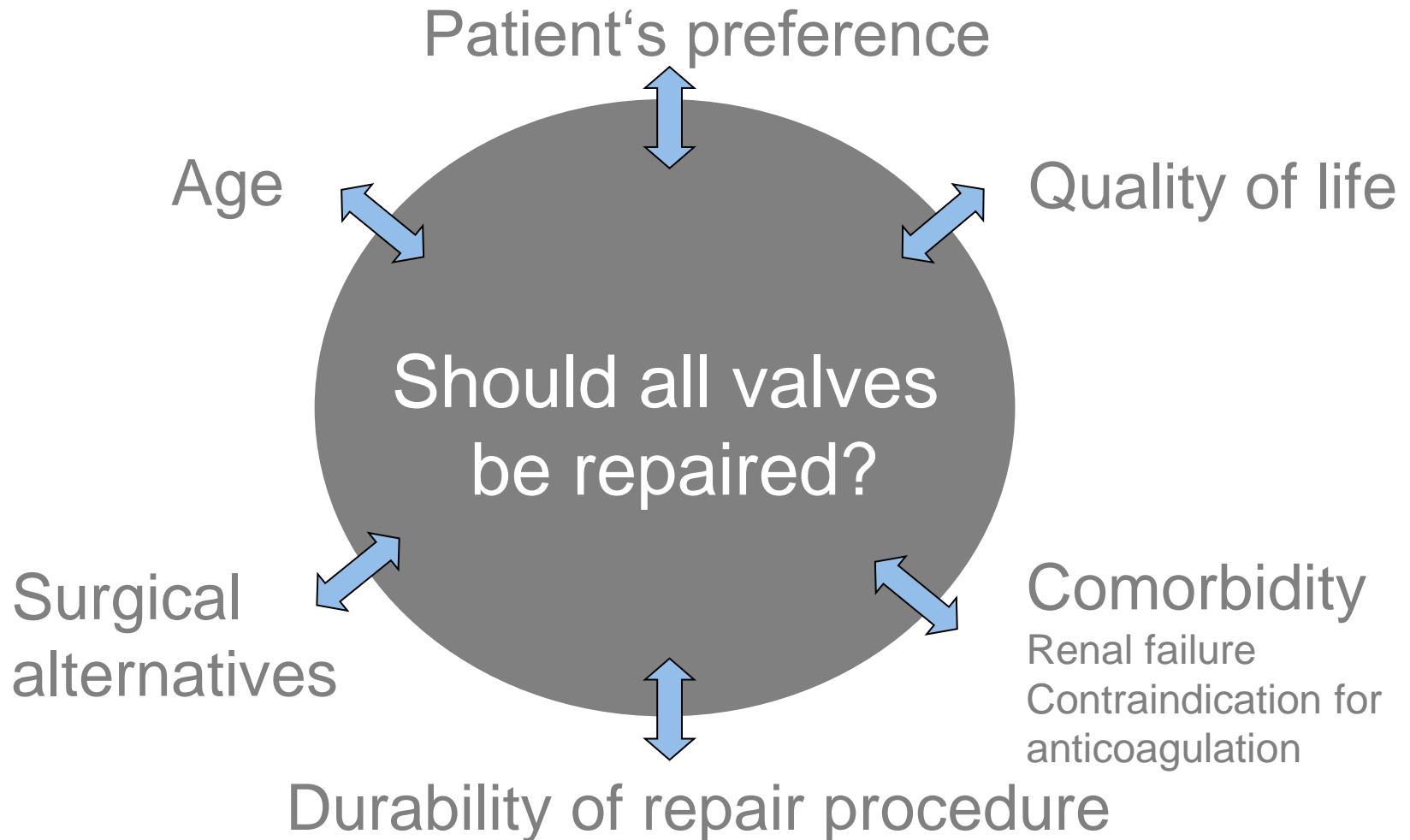


Sinutubular junction

Sinus

Aortoventricular junction

Patient selection





Patient Selection

What valve pathology can be repaired?

- Bi- /tricuspid aortic valves with preservation of the natural design (Aicher JTCVS 2004; Schäfers ATS 2007)
- Unicuspid switched to bicuspid design (Schäfers ATS 2008)
- Quadricuspid switched to tricuspid design (Schmidt ATS 2008)

Levels of Difficulty in Aortic Valve Repair

reasonable



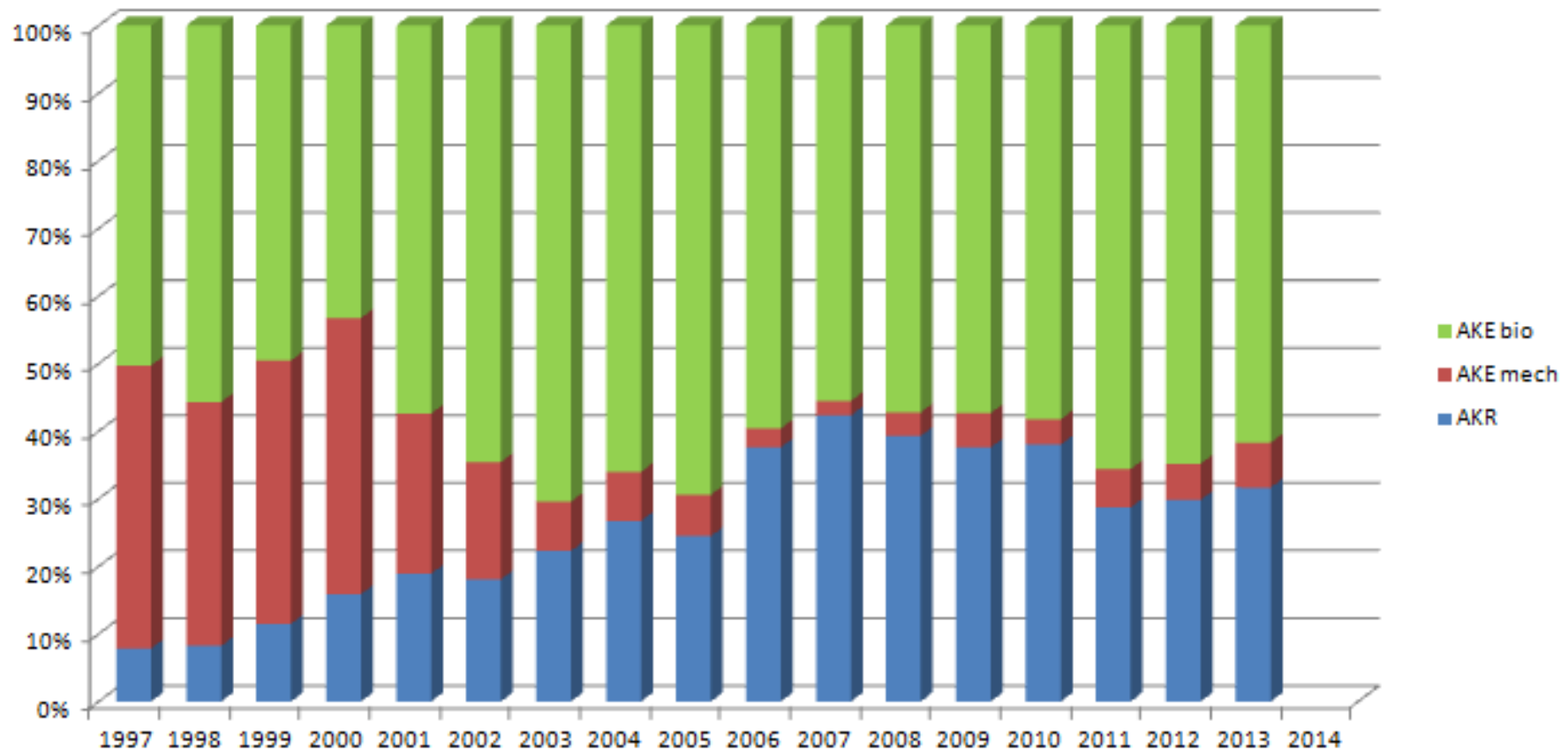
Root dilatation in tricuspid/bicuspid valves
prolapse (1 -3 cusps)
aortoventricular dilatation

fenestrations
unicuspid aortic valve

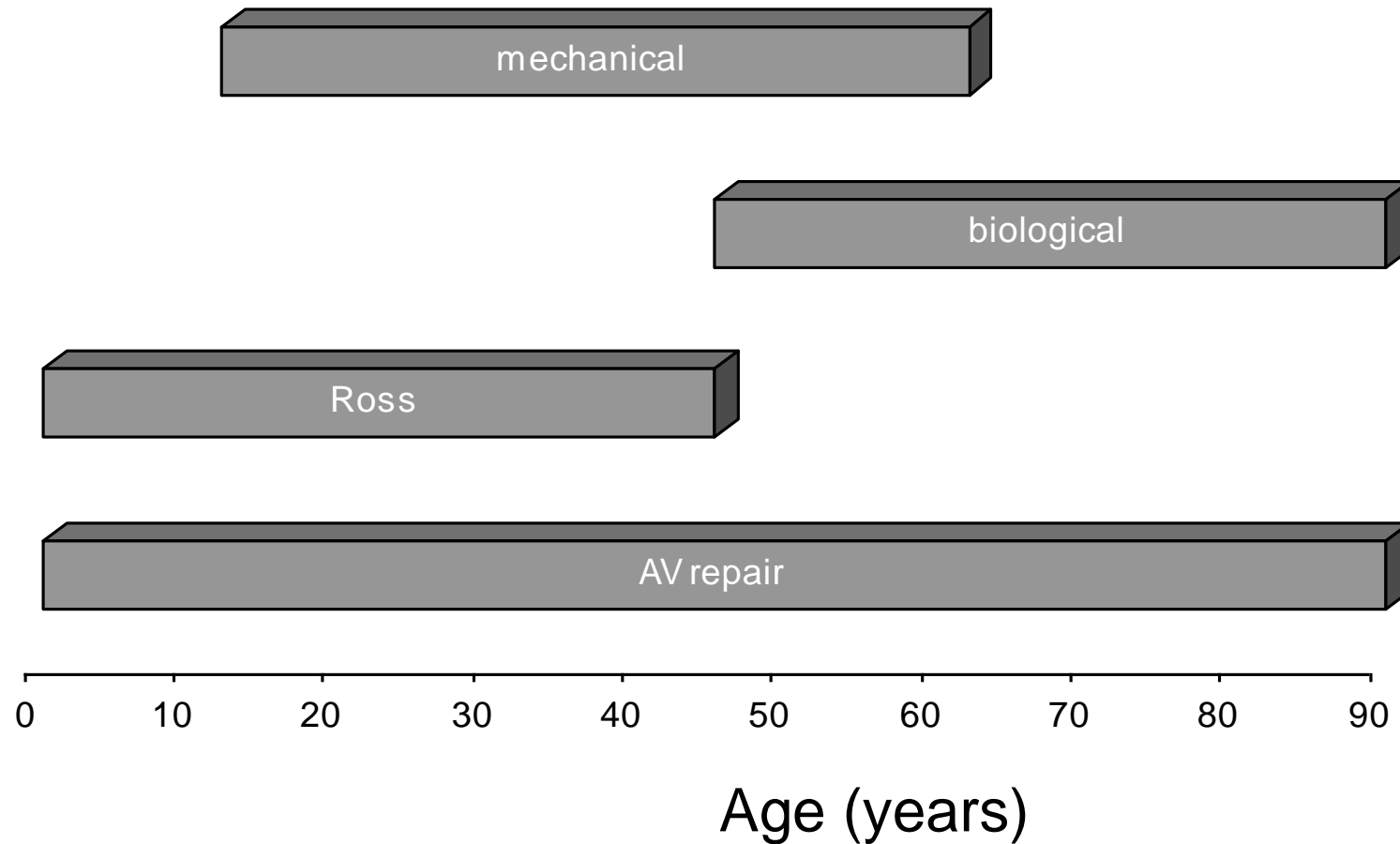
retraction/calcium
active endocarditis (size of the defect)

uncertain

Choice of Aortic Valve Procedure: Homburg



Homburg approach

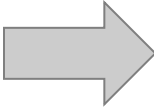
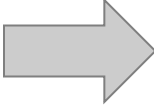
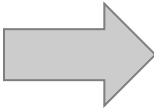




Conclusions

- Mortality after aortic valve repair is low.
- Valve-related complications after aortic valve repair are lower compared to valve replacement.
- Quality of life is better after valve repair.
- In most patients with aortic regurgitation aortic valve repair is an alternative to valve replacement.

Standardized Approach to Aortic Valve Repair

1. Checking cusp quality and measurement of geometrical height if no relevant calcification + gH > 17mm (TAV); > 20mm (BAV)  Valve preservation
2. Measurement of root dimensions if sinus diameter > 40 -45 mm and /or BAV < 150°  Root replacement
3. If root + cusp necessary  Root repair first, then
4. Correction cusp prolapse (eH)