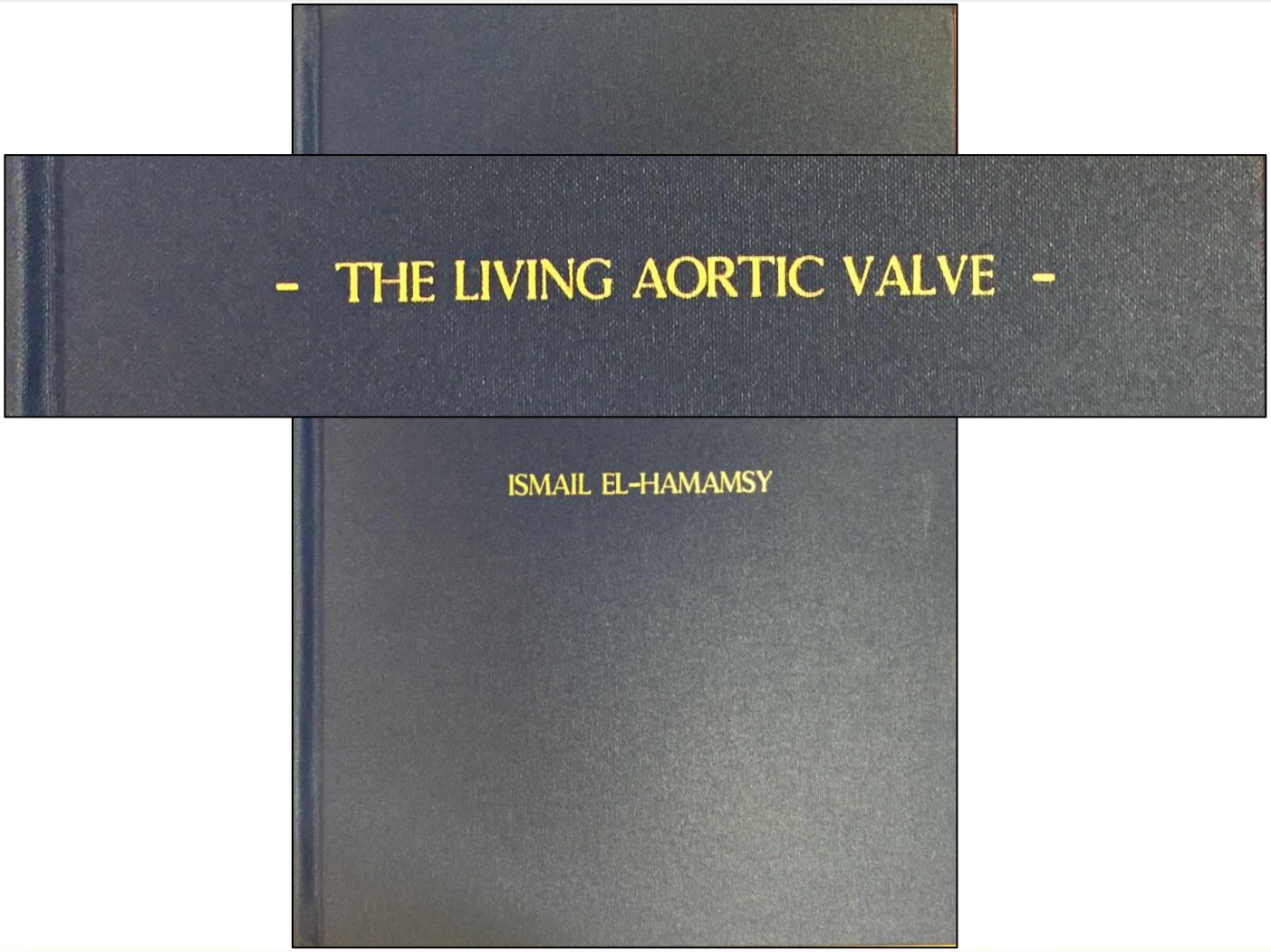
Why and When to Repair the Aortic Valve?

Ismail El-Hamamsy, MD PhD

Associate Professor
Division of Cardiac Surgery
Co-Director, Aortic and Connective Tissue Clinic
Montreal Heart Institute
Université de Montreal

PhD Thesis – Imperial College London (2010)



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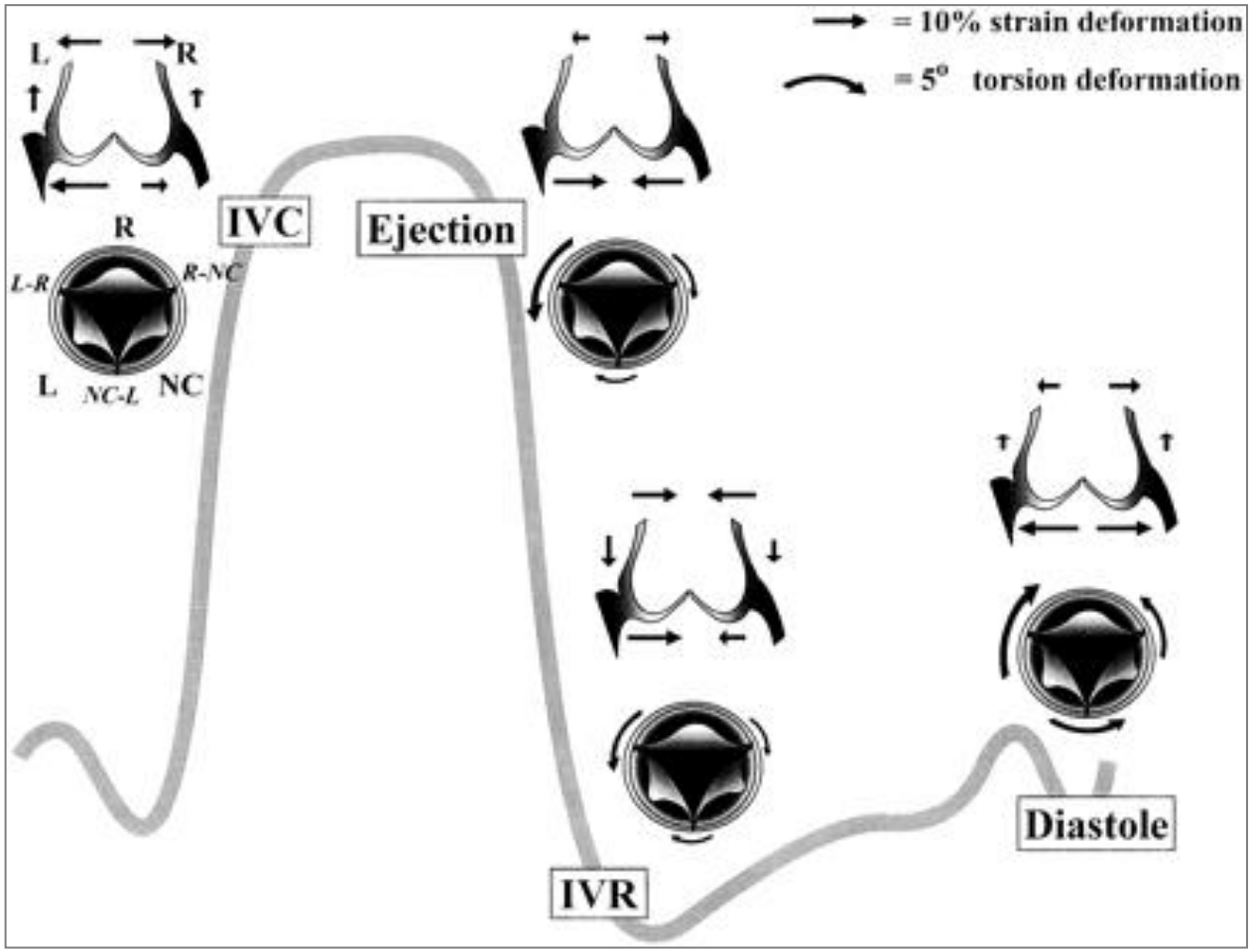
THE AORTIC ROOT IS

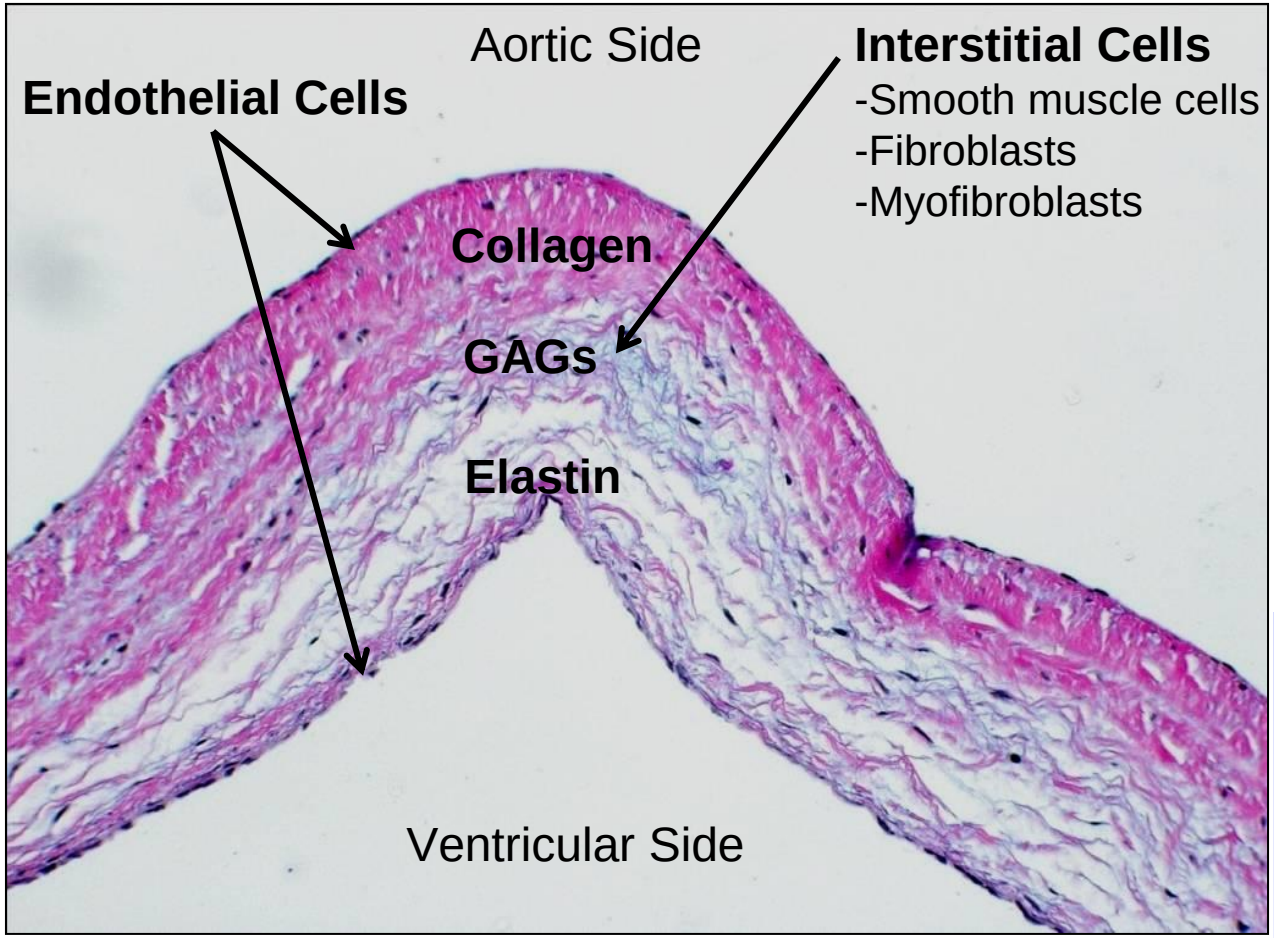
A LIVING STRUCTURE

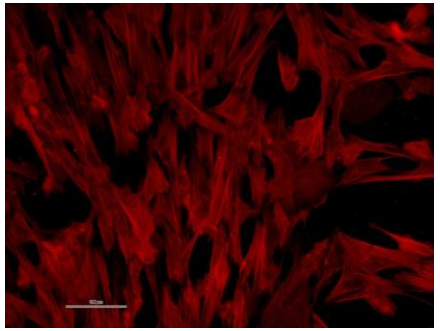
AORTIC ROOT DYNAMICS



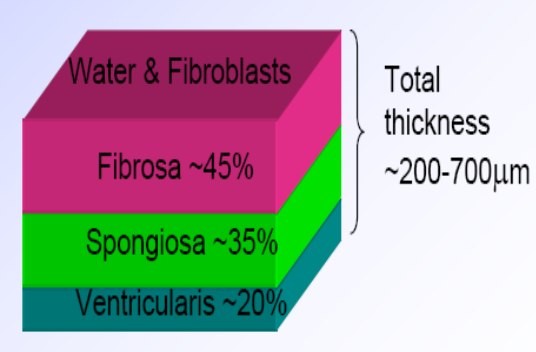
Dagum et al. Circulation 1999

AORTIC VALVE STRUCTURE





Smooth muscle actin



El-Hamamsy et al. J Adv Res 2009

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VALVE ENDOTHELIAL CELL HETEROGENEITY

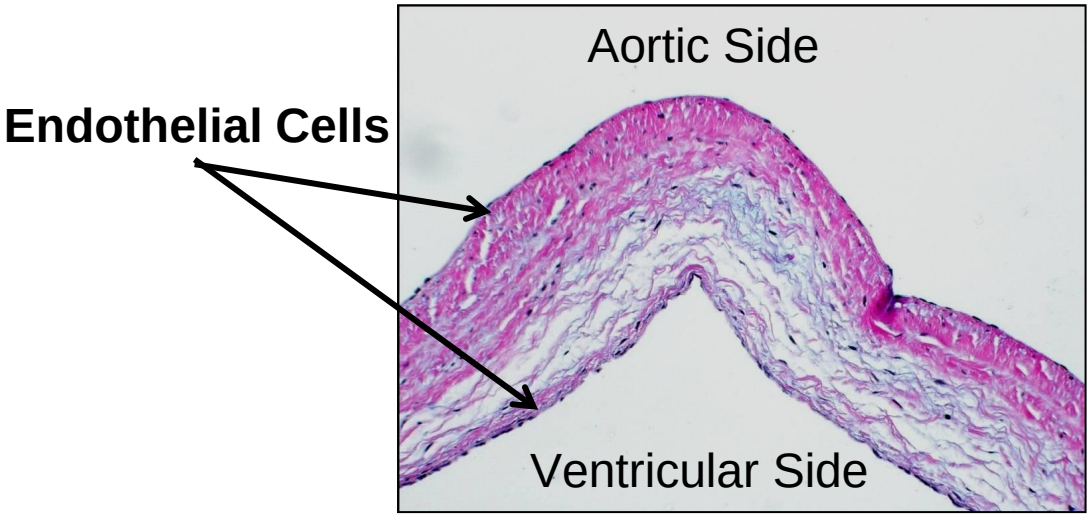


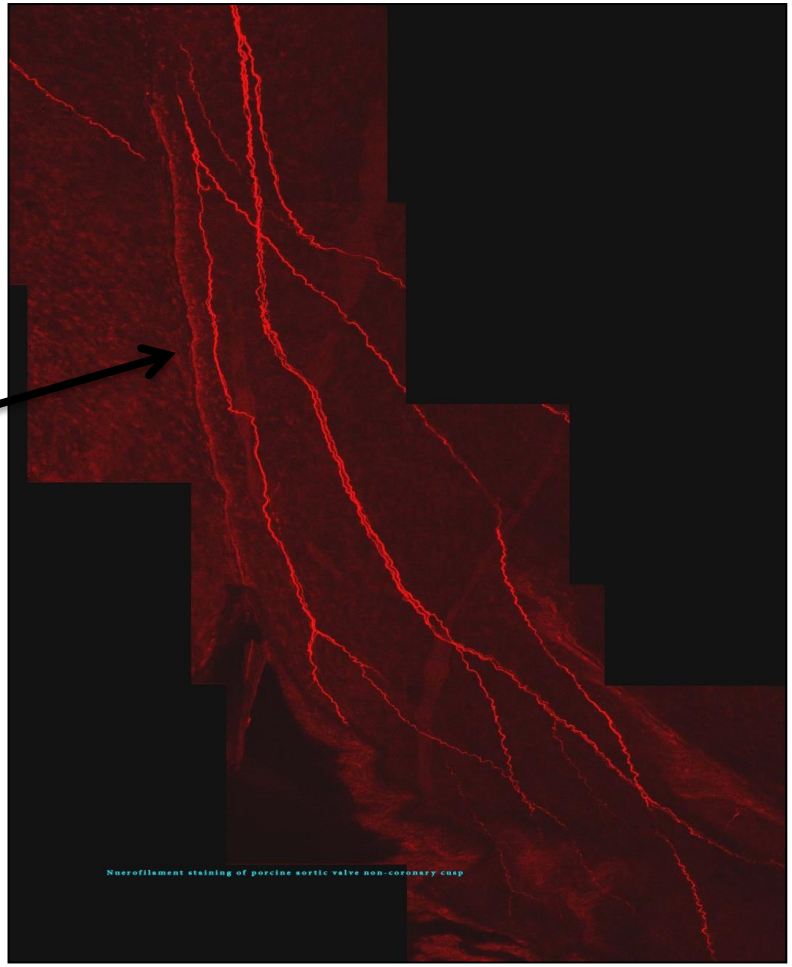
TABLE 3. Differentially Expressed Genes Related to Skeletal Development and Vascular Calcification

Lower Expression on Aortic Side				Higher Expression on Aortic Side			
Gene*	Accession No.	A/V Fold Change†	Putative Effect‡	Gene*	Accession No.	A/V Fold Change†	Putative effect‡
TNFRSF11B	U94332	−3.53	+	*BMP4*	NM_001202	1.57	+
NPPC	D90337	−3.12	+	*PTN*	AU120808	1.53	+
CHRD	AF209928	−1.37	+	*HAPLN1*	U43328	1.49	+
PTH	V00597	−1.31	+	*FBN1*	X63556	1.39	+
COL11A1	J04177	−1.44	–	*CHAD*	AF371328	1.37	+
BMP1	NM_006129	−1.52	?	*OSTF1*	BC007459	1.24	?
BMP6	AA426586	−1.29	?				

Simmons et al. Circ Res 2005

AORTIC VALVE CELLULAR STRUCTURE

Neurofilament



El-Hamamsy et al. Curr Vasc Pharmacol 2009

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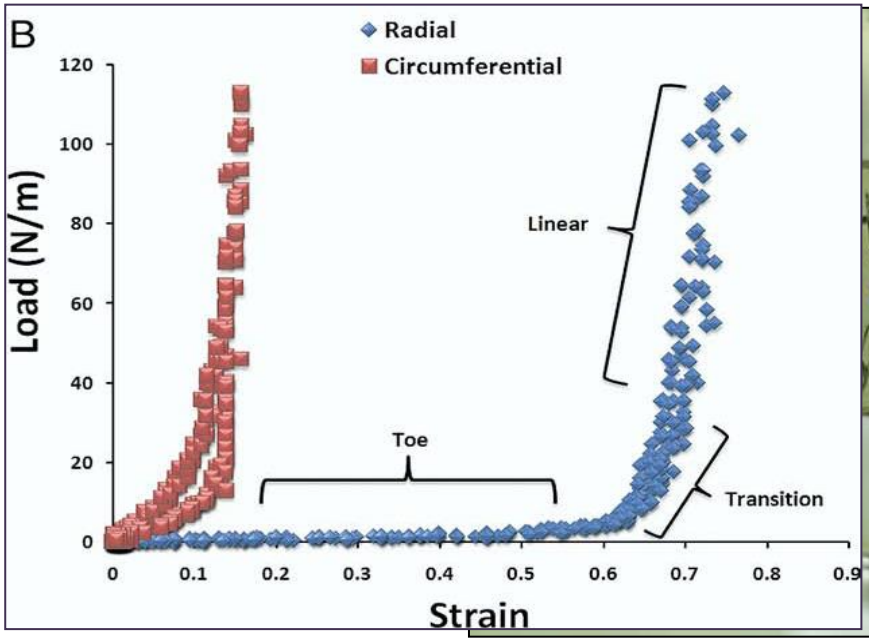
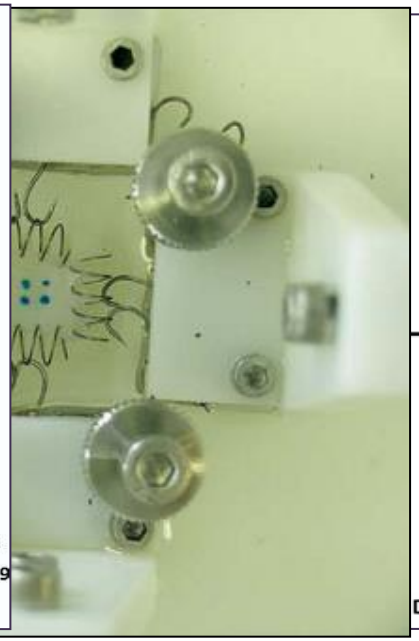
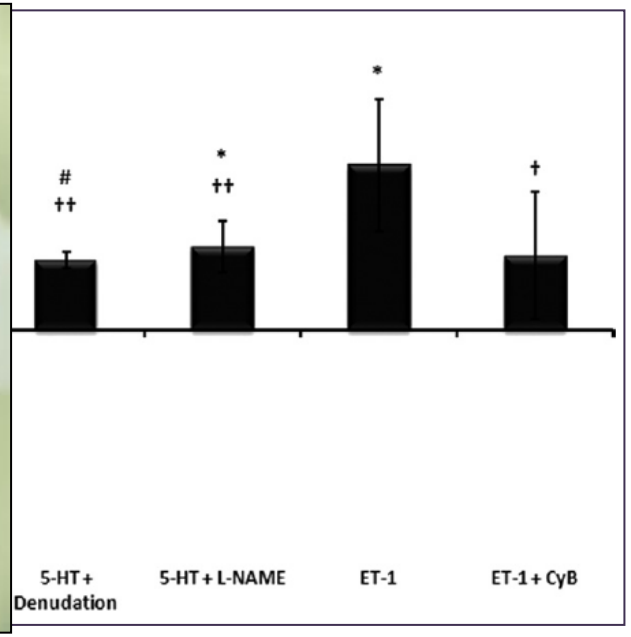
AORTIC VALVE FUNCTION

Endothelium-Dependent Regulation of the Mechanical Properties of Aortic Valve Cusps

Ismail El-Hamamsy, MD,* Kartik Balachandran, MS,† Magdi H. Yacoub, FRS,*
Louis M. Stevens, MD, SM,‡ Padmini Sarathchandra, PHD,* Patricia M. Taylor, PHD,*
Ajit P. Yoganathan, PHD,† Adrian H. Chester, PHD*







El-Hamamsy et al. JACC 2009

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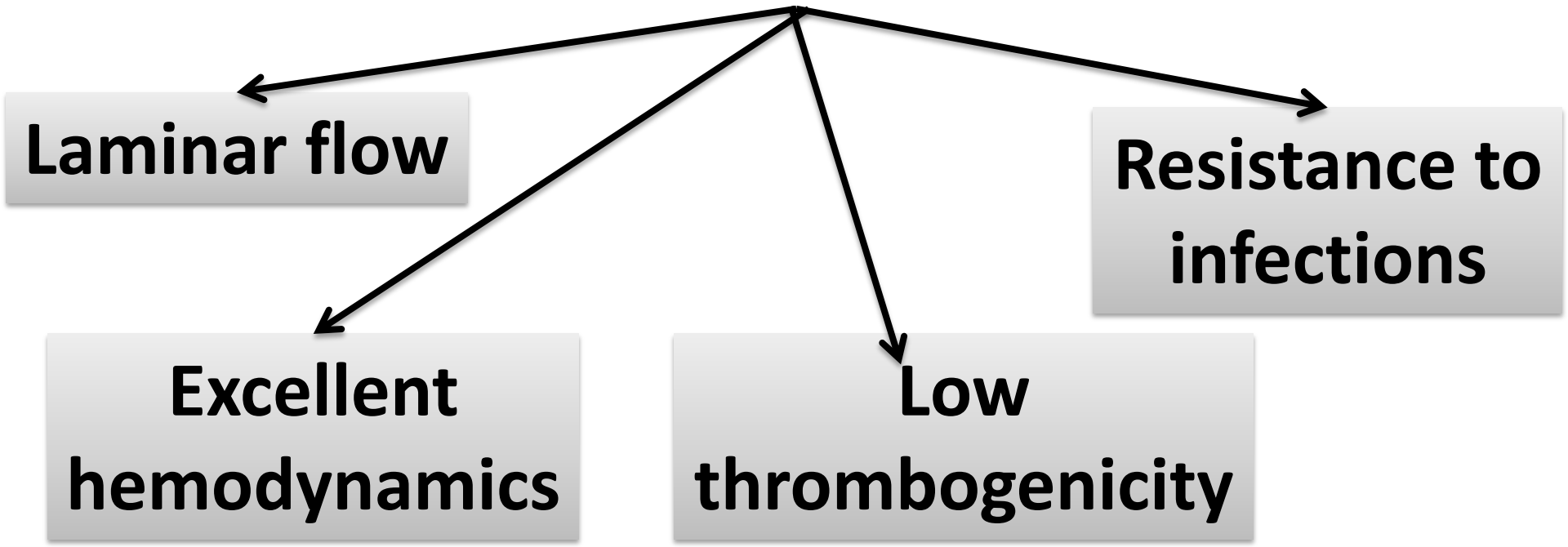
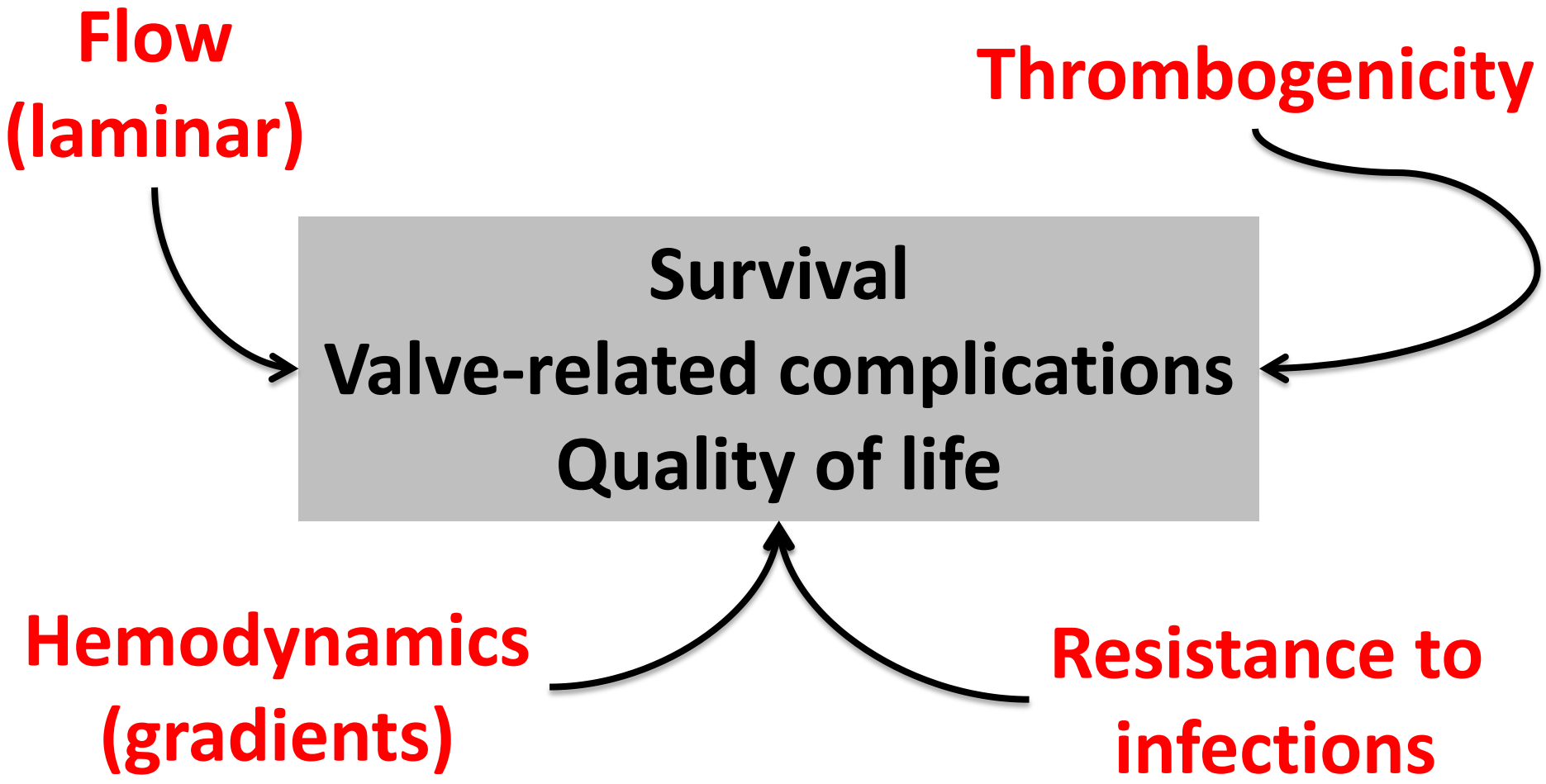
THE AORTIC ROOT

LIVING STRUCTURE
=
COMPLEX FUNCTIONS



OUTCOMES FOLLOWING AV SURGERY



Rationale

A LIVING AORTIC VALVE

IMPROVED CLINICALLY-RELEVANT OUTCOMES

YOUNG ADULTS

- **High level of physical activity**
- **Quality of life**
- **Prolonged anticipated life expectancy**

  = Exposure to valve-related complications

  – Degeneration + Reoperation (tissue valves)

  – Bleeding + Thromboembolisms (mechanical valves)

-2-

CONVENTIONAL AVR IN THE YOUNG

=

EXCESS MORTALITY

CONVENTIONAL AVR

SEVERAL ADVANTAGES

– Standardized

– Easily reproducible

– Short operative times

– Long-term data

AVR IN THE YOUNG

Observed and Relative Survival After Aortic Valve Replacement

Per Kvidal, MD,* Prof. Reinhold Bergström, PHD,‡ Lars-Gunnar Hörte, PM, BA,§ Elisabeth Ståhle, MD, PHD†

Uppsala and Stockholm, Sweden

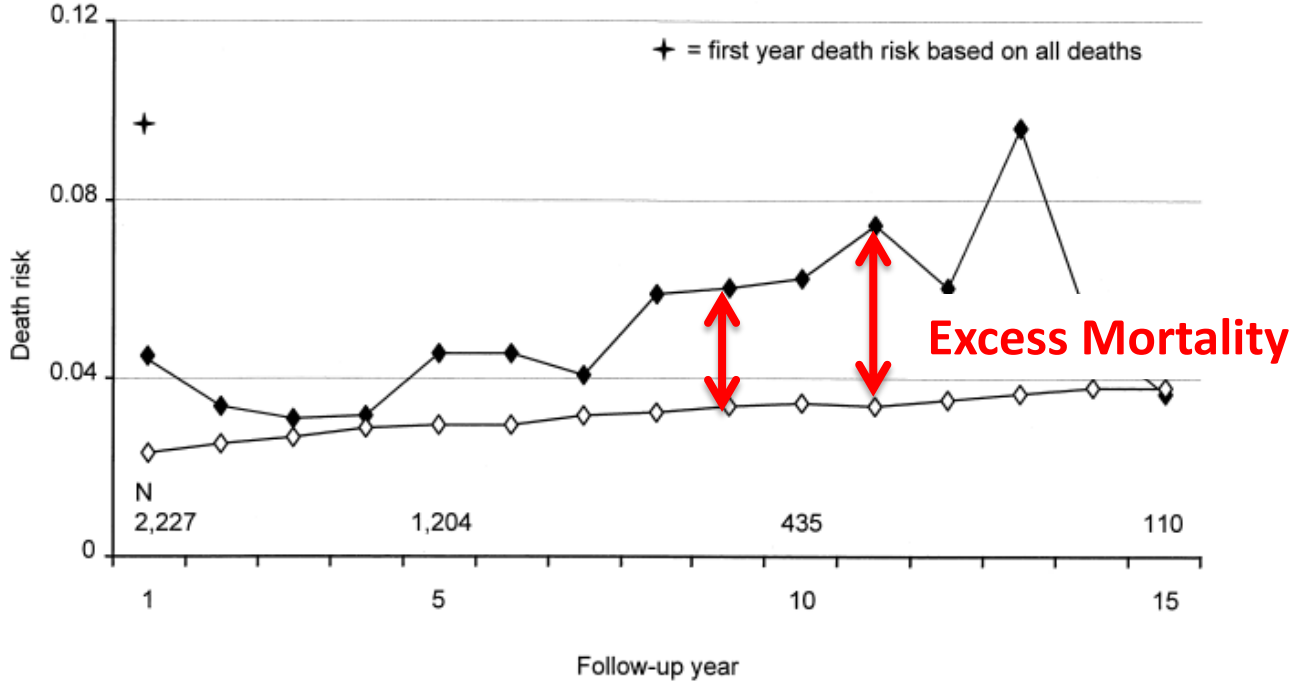


Figure 2. The annual observed **(solid diamonds)** and expected **(open diamonds)** death risk after primary AVR in patients who survived the first postoperative month (n = 2,227). The numbers (N) of patients at risk and the first year death risk are given.

Kvidal et al. JACC 2000

AVR IN THE YOUNG

Table 4. Basic Data Concerning Observed and Expected Deaths Based on Data From Follow-Up Years 1 through 15*

	Patient-Years at Risk	Observed Number of Deaths	Expected Number of Deaths	O/E Deaths
Age (yrs)				
≤50	2,182	31	6.8	4.5
51–60	2,954.5	98	36.9	2.7
61–70	5,578.5	274	152.1	1.8
≥71	3,579	212	208.2	1.0

The younger the patients are,
The higher excess mortality is

Kvidal et al. JACC 2000

MECHANICAL AVR IN THE YOUNG

Long-term outcomes after elective isolated mechanical aortic valve replacement in young adults

Ismail Bouhout, MSc,[a] Louis-Mathieu Stevens, MD, PhD,[b] Amine Mazine, MSc,[a] Nancy Poirier, MD,[a] Raymond Cartier, MD,[a] Philippe Demers, MD,[a] and Ismail El-Hamamsy, MD, PhD[a]

1997-2006: 469 isolated mechanical AVR <65 years

Mean follow-up: 9.1 ± 3.5 years

Follow-up 95% complete (4099 patient-years)

Mean age: 53.2 ± 9.2

Bouhout et al. JTCVS 2014

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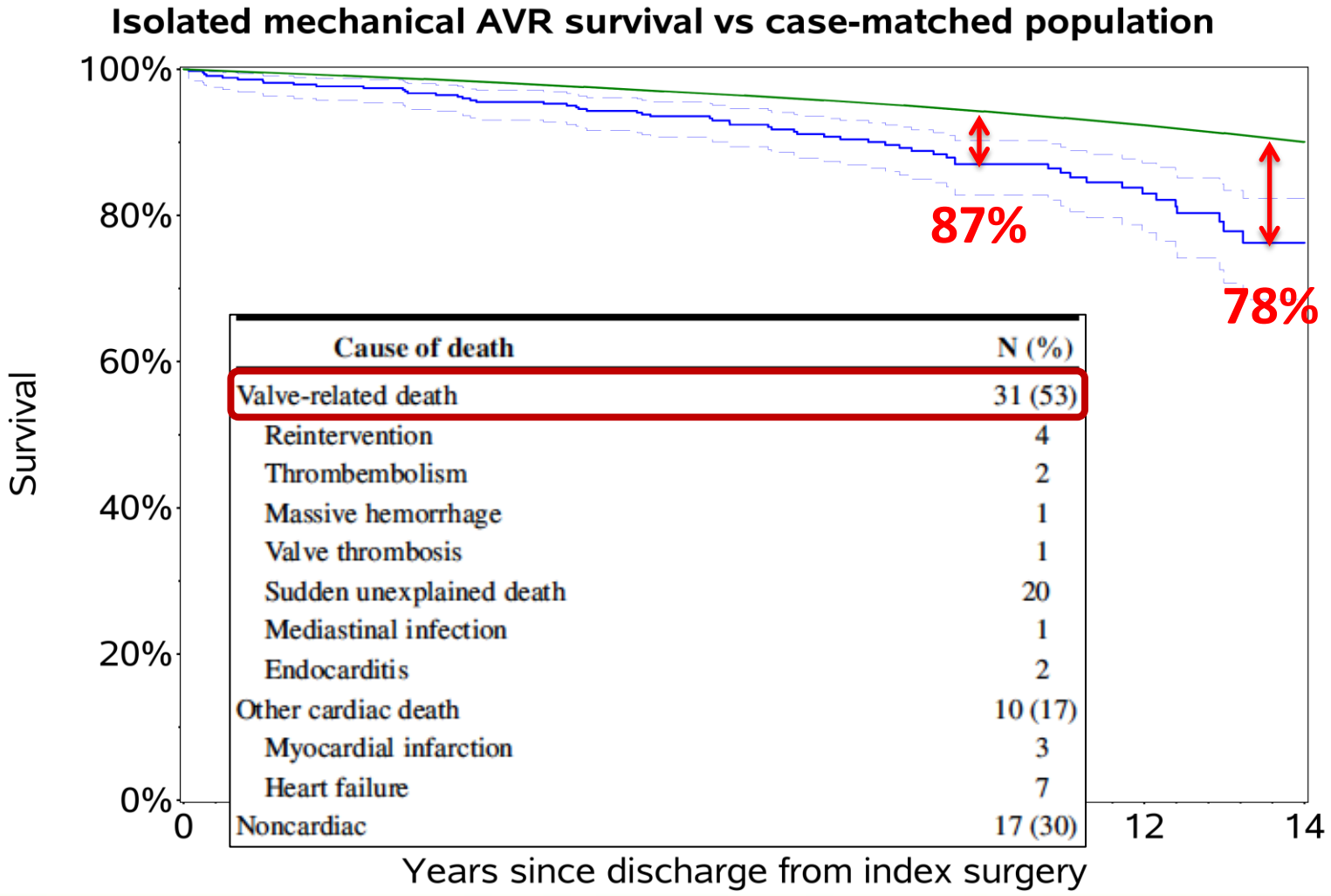
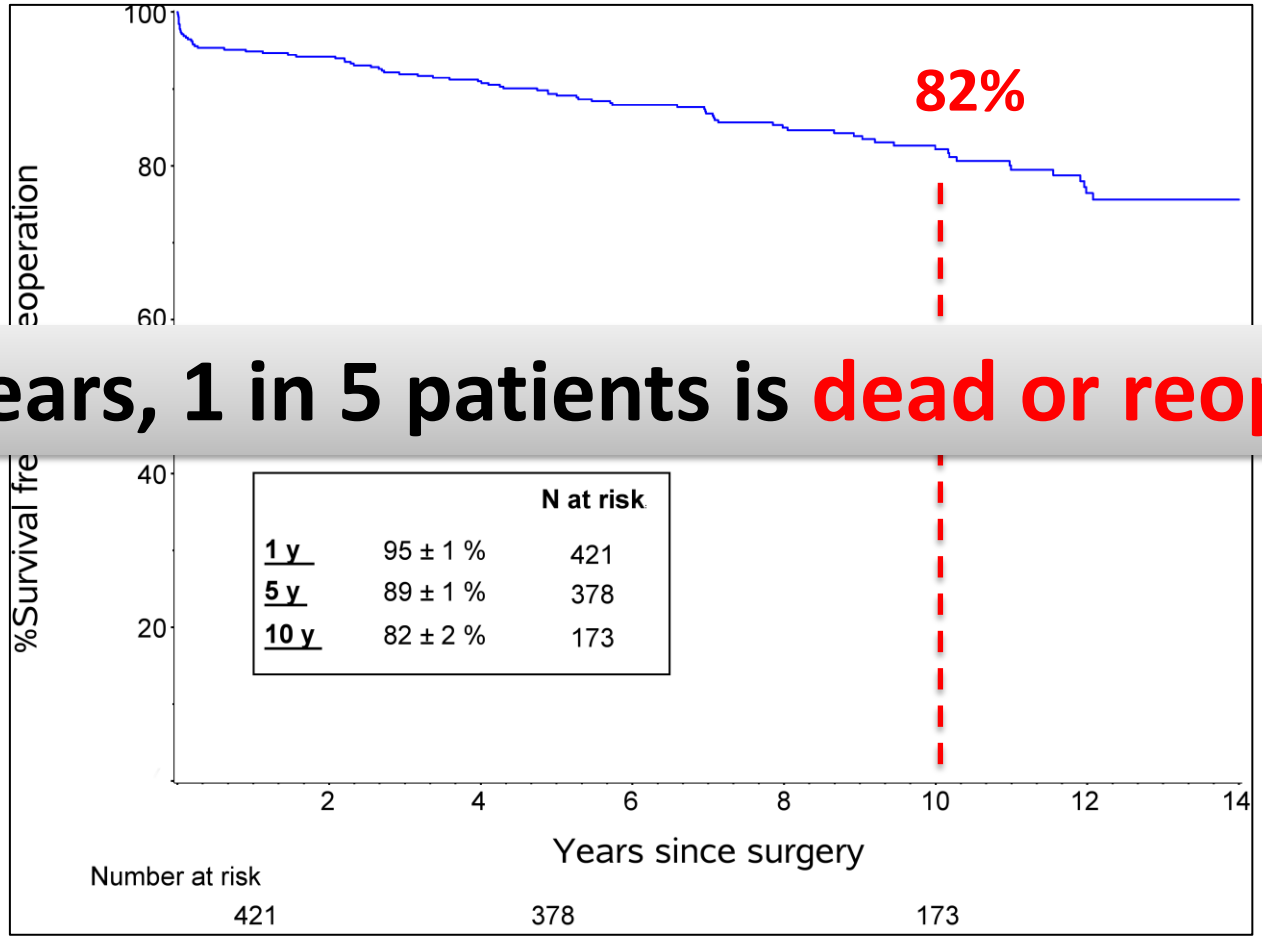
SURVIVAL – MECHANICAL AVR



Cause of death	N (%)
Valve-related death	31 (53)
Reintervention	4
Thrombembolism	2
Massive hemorrhage	1
Valve thrombosis	1
Sudden unexplained death	20
Mediastinal infection	1
Endocarditis	2
Other cardiac death	10 (17)
Myocardial infarction	3
Heart failure	7
Noncardiac	17 (30)

Bouhout et al. JTCVS 2014

SURVIVAL FREE FROM REOPERATION



A 10 years, 1 in 5 patients is dead or reoperated

Bouhout et al. JTCVS 2014

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Valve-Related Complications

On-X aortic heart valves

INR: 1.5–2.0 | Design | PROACT | Con

PROACT RESULTS

Prospective Randomized On-X Valve Anticoagulation Clinical Trial

- 65% Fewer Bleeds
- No Increase in TE
- INR: 1.5–2.0
- 63,000 INR Data Points
- 33 US Centers

Learn More

» Read the article at JTCVS

» Watch the slide presentation

» Request more information

PROACT Trial (n=375 pts)

AVR High-risk postrandomization event comparisons

Primary Event	Test group (pt-yr = 766.2) Patients (n)	Test group (pt-yr = 766.2) Rate (%/pt-yr)	Control group (pt-yr = 878.6) Patients (n)	Control group (pt-yr = 878.6) Rate (%/pt-yr)	Rate Ratio (test/ctrl)	95% CI	*P*-value
Bleeding							
Major	**12**	**1.57**	**34**	**3.87**	**0.40**	**0.21-0.78**	**0.007**
Hemorrhagic stroke	1	0.13	4	0.46	0.29	0.03-2.56	0.264
Minor	**9**	**1.17**	**35**	**3.98**	**0.29**	**0.14-0.61**	**0.001**
Total	**21**	**2.74**	**69**	**7.85**	**0.35**	**0.21-0.57**	**<0.001**
Ischemic stroke	6	0.78	7	0.80	0.98	0.33-2.92	0.975
TIA	11	1.44	7	0.80	1.80	0.70-4.65	0.223
Neurologic event	17	2.22	14	1.59	1.39	0.69-2.82	0.359
Peripheral TE	4	0.52	1	0.11	4.59	0.51-41.04	0.173
All TE	21	2.74	15	1.71	1.61	0.88-3.11	0.161
Thrombosis	2	0.26	2	0.23	1.15	0.16-8.14	0.891
Major event (major bleeding, all TE, thrombosis)	35	4.57	51	5.80	0.79	0.51-1.21	0.275
Primary endpoint	**44**	**5.74**	**86**	**9.79**	**0.59**	**0.41-0.84**	**0.004**

Puskas et al. JTCVS 2014

TISSUE AVR IN THE YOUNG

Survival after valve replacement for aortic stenosis: Implications for decision making

Tomislav Mihaljevic, MD,[a] Edward R. Nowicki, MD,[a] Jeevanantham Rajeswaran, MSc,[b] Eugene H. Blackstone, MD,[a,b] Luigi Lagazzi, MD,[a] James Thomas, MD,[c] Bruce W. Lytle, MD,[a] and Delos M. Cosgrove, MD[a]

3,049 Perimount patients; 1991-2004

". . .younger patients had worse than expected survival that was further diminished with insertion of a small prosthesis."

Mihajlevic et al. JTCVS 2008

TISSUE AVR IN THE YOUNG

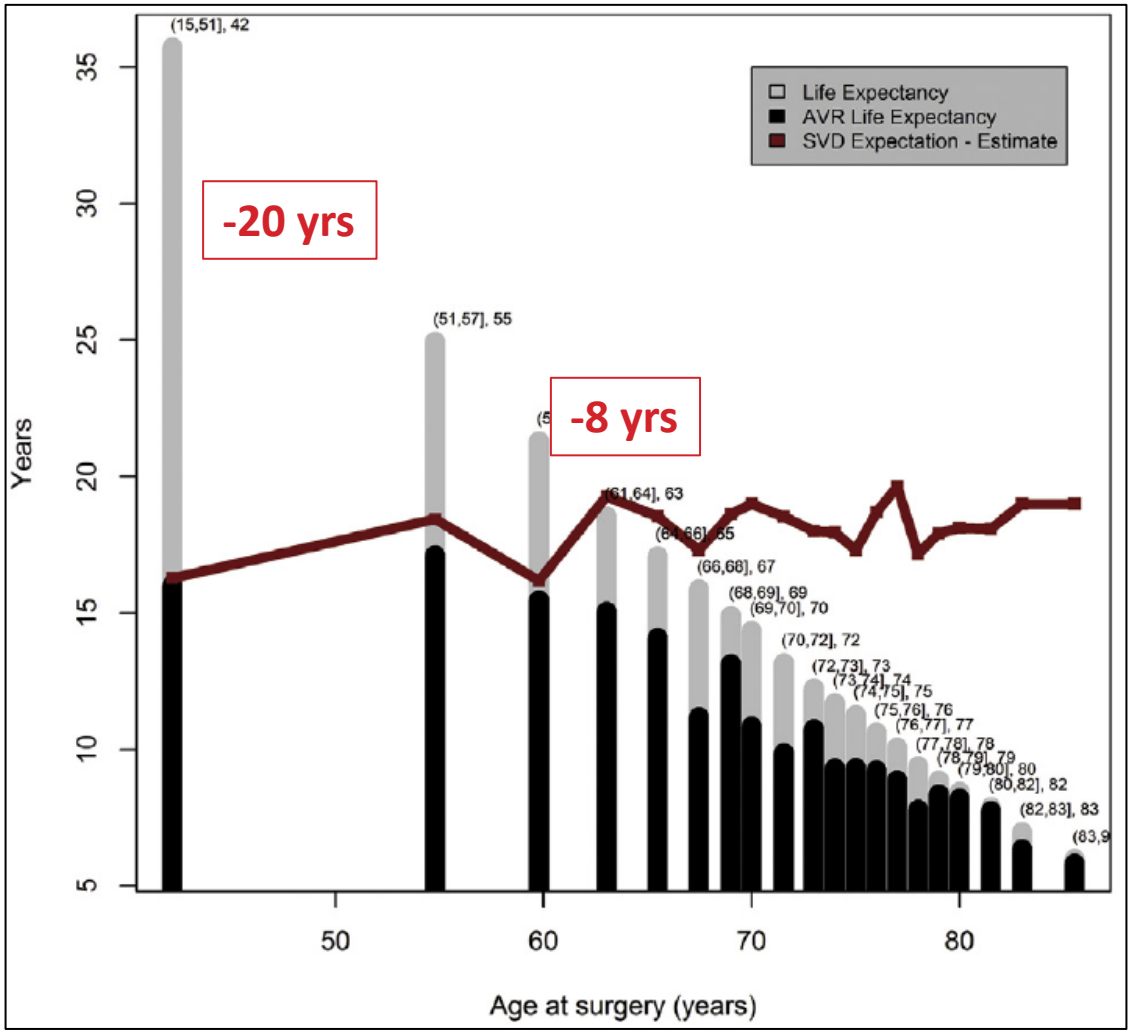
Very Long-Term Outcomes of the Carpentier-Edwards Perimount Valve in Aortic Position

Thierry Bourguignon, MD, Anne-Lorraine Bouquiaux-Stablo, MD, Pascal Candolfi, PhD, Alain Mirza, MD, Claudia Loardi, MD, Marc-Antoine May, MD, Rym El-Khoury, MD, Michel Marchand, MD, and Michel Aupart, MD

2,659 Perimount patients; 1984-2008

Bourguignon et al. Ann Thorac Surg 2015

Excess Mortality in Young Adults



Bourguignon et al. Ann Thorac Surg 2015

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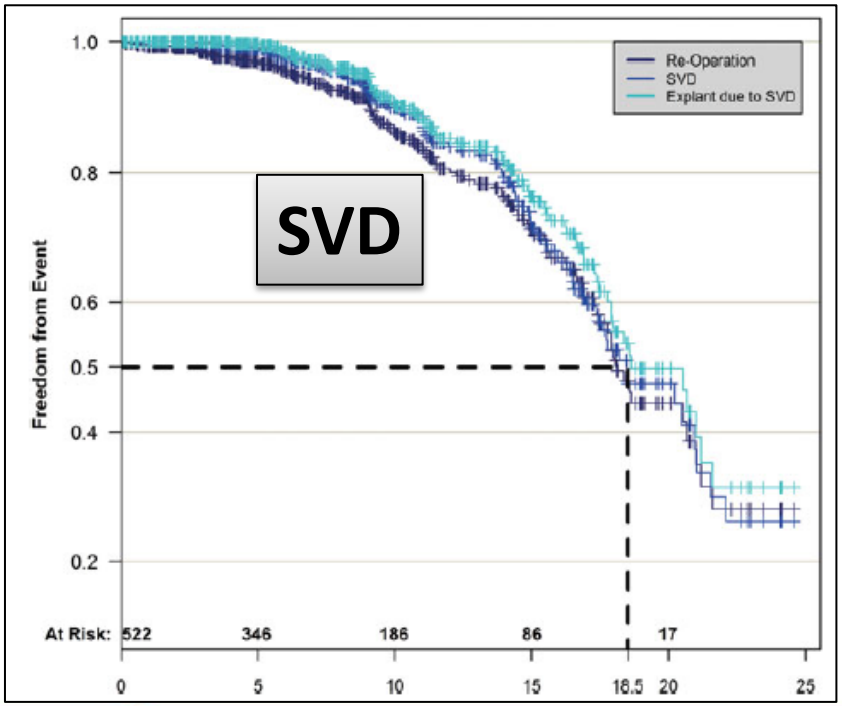
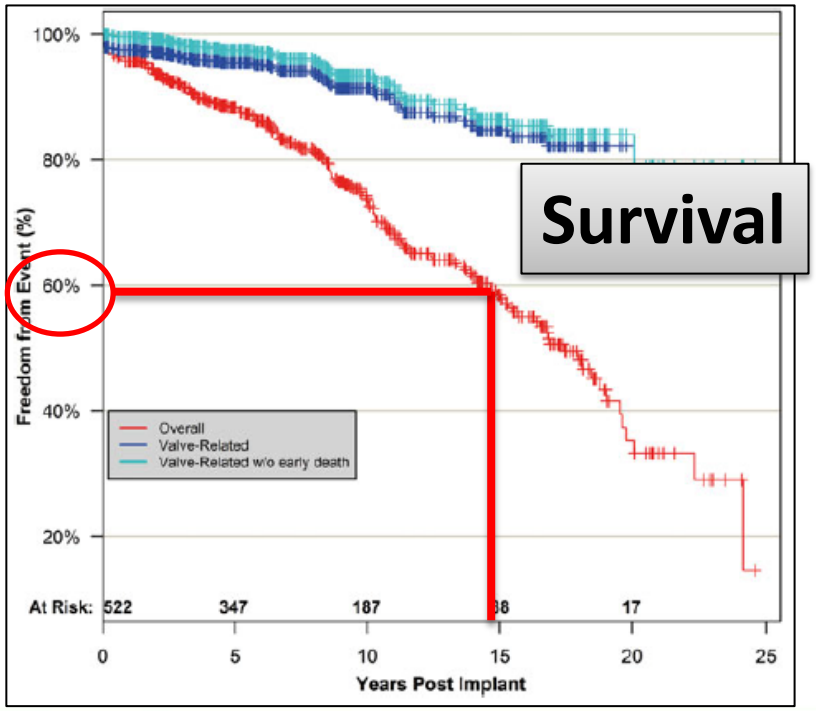
SVD and Death = Competing Risks

Very long-term outcomes of the Carpentier-Edwards Perimount aortic valve in patients aged 50–65 years†

Thierry Bourguignon[a,*], Pierre Lhommet[a], Rym El Khoury[a], Pascal Candolfi[b], Claudia Loardi[a], Alain Mirza[a], Julie Boulanger-Lothion[a], Anne-Lorraine Bouquiaux-Stablo-Duncan[a], Michel Marchand[a] and Michel Aupart[a]





Bourguignon et al. Eur J Cardiothorac Surg 2016

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TISSUE AVR IN THE YOUNG

The Perimount Valve in the Aortic Position: Twenty-Year Experience With Patients Under 60 Years Old

Jessica Forcillo, MD, MS, Ismail El Hamamsy, MD, PhD,
Louis-Mathieu Stevens, MD, PhD, David Badrudin, Michel Pellerin, MD,
Louis P. Perrault, MD, PhD, Raymond Cartier, MD, Denis Bouchard, MD, MS,
Michel Carrier, MD, MBA, and Philippe Demers, MD, MS

Department of Cardiac Surgery, Montreal Heart Institute and Université de Montréal, Montreal, Quebec, Canada

Forcillo et al. ATS 2014

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TISSUE AVR IN THE YOUNG

1981-2011: 144 isolated bioprosthetic AVRs

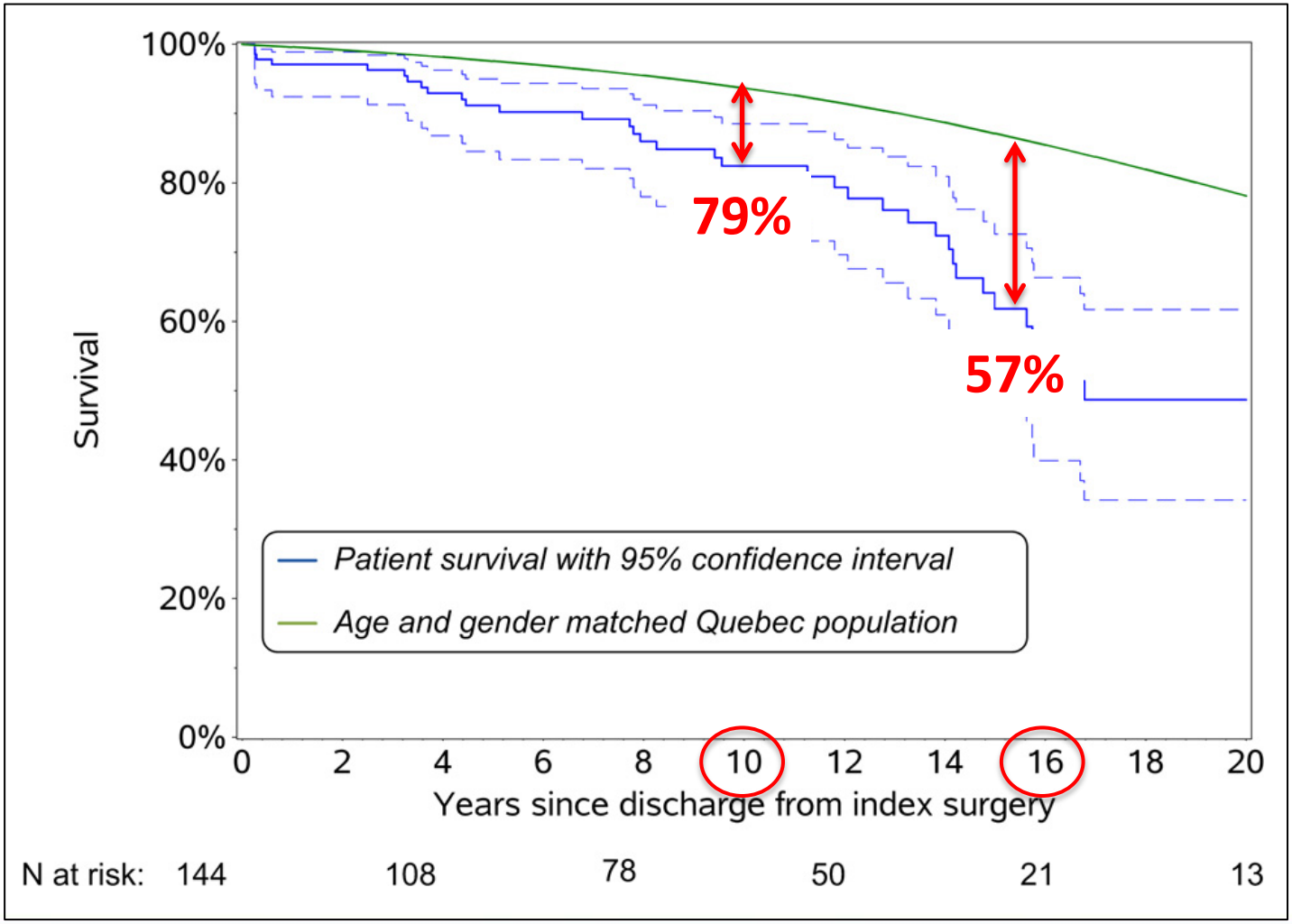
Exclusion: Concomitant procedures, reoperations, urgent operations

Mean age: 51 ± 9 years

Mean follow-up: 10 years

Forcillo et al. ATS 2014

TISSUE AVR IN THE YOUNG



Forcillo et al. ATS 2014

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CONVENTIONAL AVR IN THE YOUNG

~~CURATIVE~~

PALLIATIVE

EXCESS MORTALITY IS OBSERVED

UP TO 60 YEARS OF AGE

AT THE TIME OF SURGERY

A LIVING AORTIC VALVE

=

IMPROVED OUTCOMES?

AORTIC VALVE REPAIR

IS IT WORTHWHILE?

Why?

IS IT DURABLE?

When?

AORTIC VALVE REPAIR

- No randomized trials

- Single-center (single-surgeon) series

SURVIVAL

SURVIVAL

Risk of Valve-Related Events After Aortic Valve Repair

Joel Price, MD, MPH, Laurent De Kerchove, MD, David Glineur, MD, PhD, Jean-Louis Vanoverschelde, MD, PhD, Philippe Noirhomme, MD, and Gebrine El Khoury, MD

1995-2010: 475 elective AV repair (AI or aneurysm)

Mean age: 53 ± 16 years

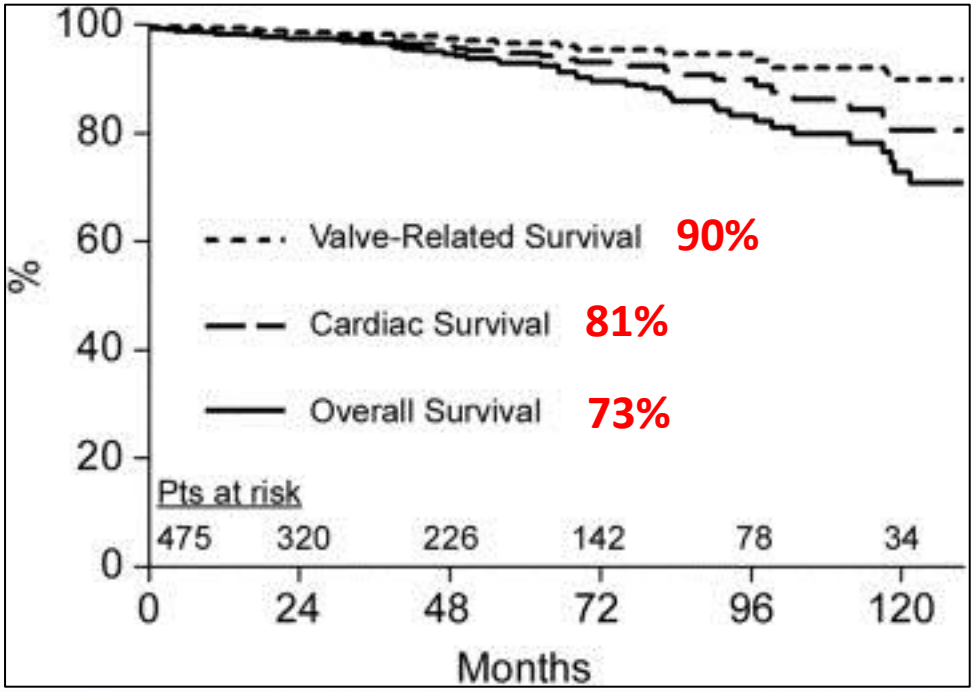
Mean follow-up: 4.6 years

Price et al. Ann Thor Surg 2013

SURVIVAL

Risk of Valve-Related Events After Aortic Valve Repair

Joel Price, MD, MPH, Laurent De Kerchove, MD, David Glineur, MD, PhD, Jean-Louis Vanoverschelde, MD, PhD, Philippe Noirhomme, MD, and Gebrine El Khoury, MD



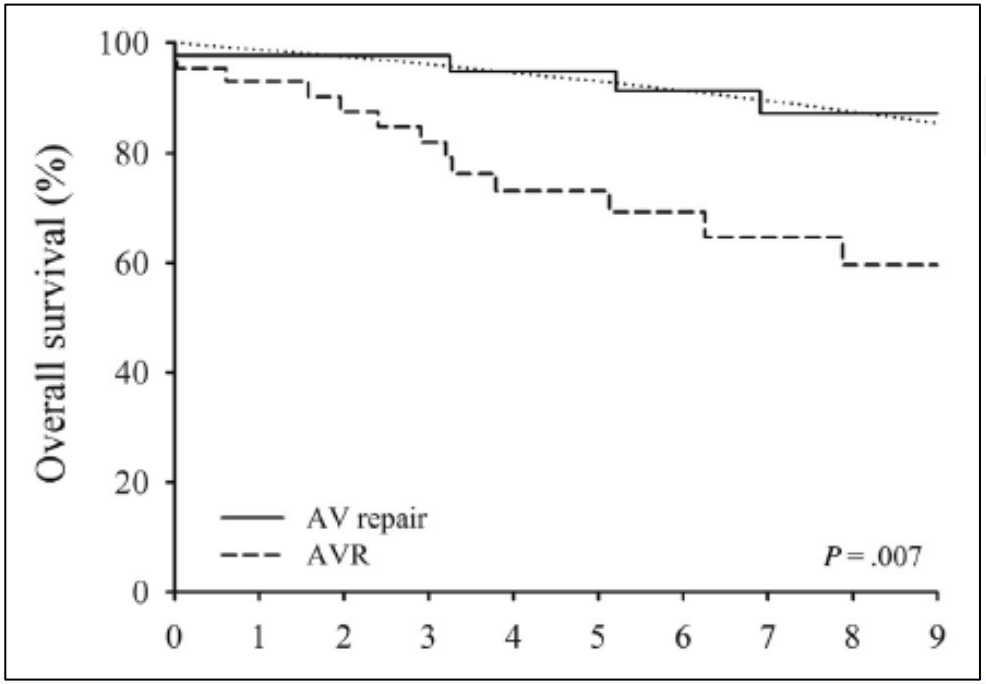
73%

Price et al. Ann Thor Surg 2013

SURVIVAL

Valve repair improves the outcome of surgery for chronic severe aortic regurgitation: A propensity score analysis

Christophe de Meester, MS,[a,b] Agnès Pasquet, MD, PhD,[a,b] Bernhard L. Gerber, MD, PhD,[a,b] David Vancraeynest, MD, PhD,[a,b] Philippe Noirhomme, MD,[a,c] Gébrine El Khoury, MD,[a,c] and Jean-Louis J. Vanoverschelde, MD, PhD[a,b]



REPAIR

AVR

de Meester et al. JTCVS 2014

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SURVIVAL

A quarter of a century of experience with aortic valve-sparing operations

Tirone E. David, MD, Christopher M. Feindel, MD, Carolyn M. David, BN, and Cedric Manlhiot, BSc

1988-2010: 371 consecutive valve-sparing procedures (~15/year)

Mean age: 47 ± 15 years

Median follow-up: 8.9 years

David et al. JTCVS 2014

SURVIVAL

A quarter of a century of experience with aortic valve-sparing operations

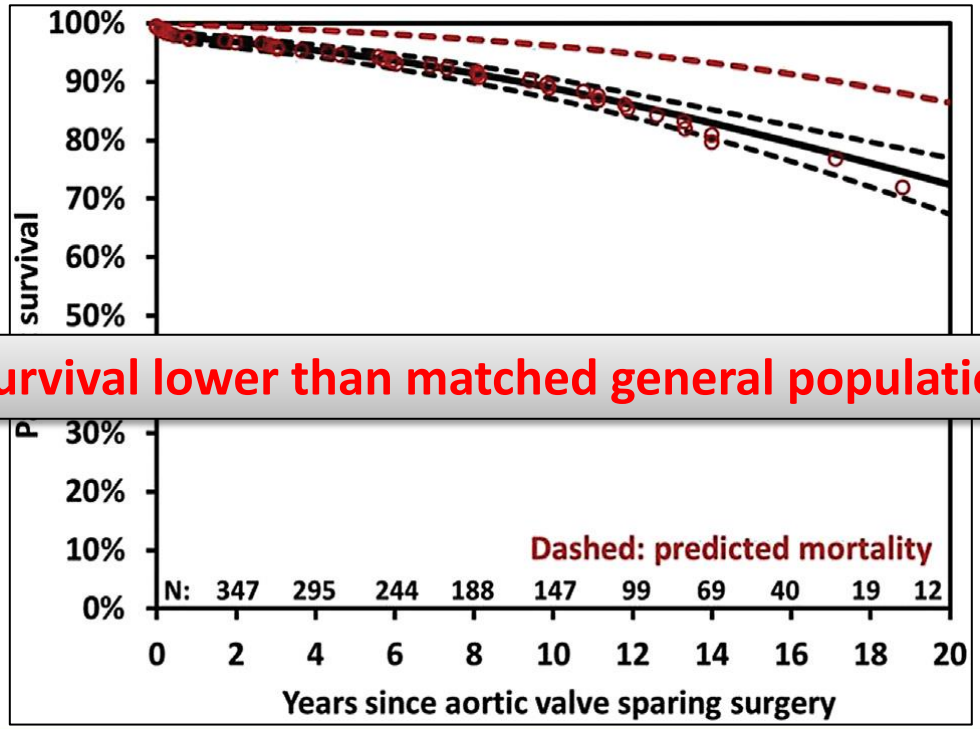
Tirone E. David, MD, Christopher M. Feindel, MD, Carolyn M. David, BN, and Cedric Manlhiot, BSc

12% Acute type A dissection

35% Marfan syndrome

N=296 Reimplantation

N=75 Remodeling



Survival lower than matched general population

David et al. JTCVS 2014

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SURVIVAL

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

Diana Aicher [a], Roland Fries [b], Svetlana Rodionycheva [a], Kathrin Schmidt [a], Frank Langer [a], Hans-Joachim Schäfers [a,*]

1995-2007: 640 consecutive valve-sparing procedures

81% of all patients with AI

Mean age: 56 ± 17 years

Mean follow-up: 4.8 years

Aicher et al. EJCTS 2010

SURVIVAL

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

Diana Aicher [a], Roland Fries [b], Svetlana Rodionycheva [a], Kathrin Schmidt [a], Frank Langer [a], Hans-Joachim Schäfers [a,*]

10% acute dissection

Survival for the whole patient cohort was 92% at 5 years and 80% at 10 years with significantly better survival in patients with a bicuspid rather than a tricuspid AV ($p = 0.0004$). Survival at 10 years was worse in patients with concomitant coronary artery bypass grafting (75% vs 85%; $p = 0.42$).

Aicher et al. EJCTS 2010

SURVIVAL

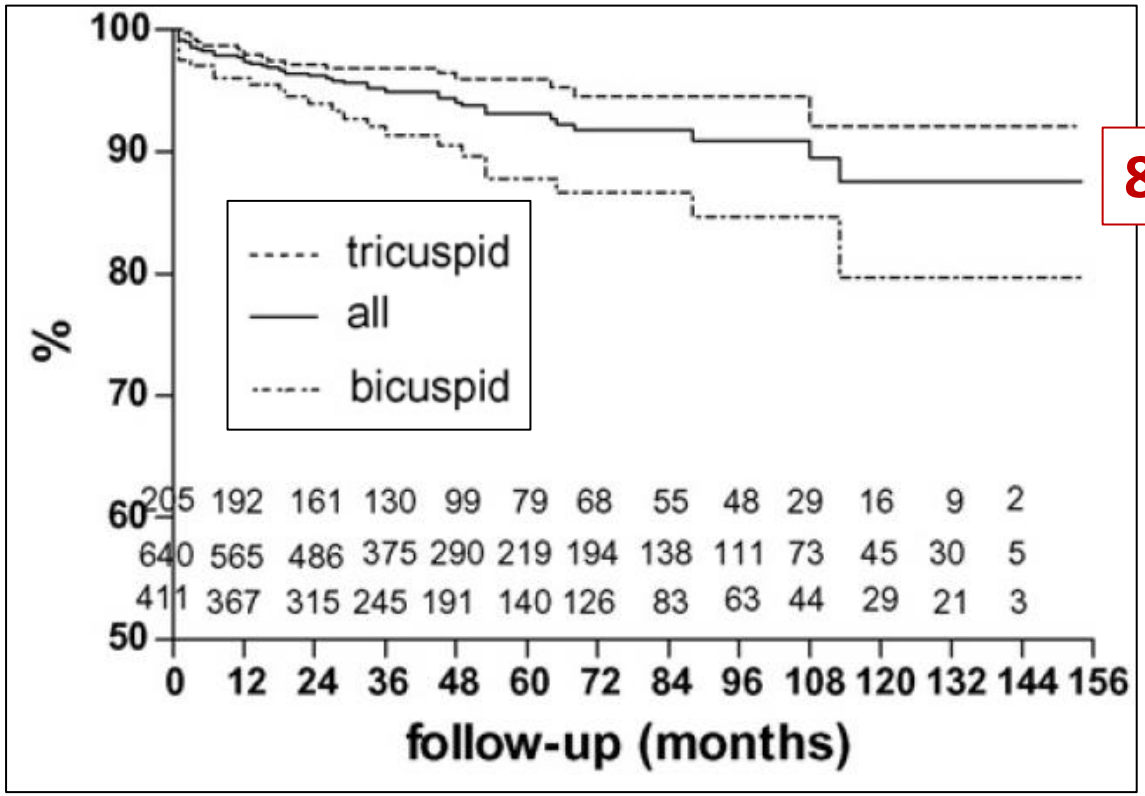
- **No studies into the second decade**
  - Mean follow-up <10 years
- **~80% survival at 10 years despite:**
  - Inclusion of acute type A dissections
  - Connective tissue disorders

VALVE-RELATED COMPLICATIONS

VALVE-RELATED COMPLICATIONS

FREEDOM FROM ALL VALVE-RELATED COMPLICATIONS

(Reoperation, endocarditis, thromboembolism and hemmorhage)



88% at 10 years

Aicher et al. EJCTS 2010

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VALVE-RELATED COMPLICATIONS

A quarter of a century of experience with aortic valve-sparing operations

Tirone E. David, MD, Christopher M. Feindel, MD, Carolyn M. David, BN, and Cedric Manlhiot, BSc

	Follow-up point (y)				
Freedom from	**1**	**5**	**10**	**15**	**18**
Mortality	97.3 ± 0.8	94.6 ± 1.2	89.0 ± 2.0	79.7 ± 3.4	76.8 ± 4.3
Reoperation*	99.7 ± 0.3	99.7 ± 0.3	97.0 ± 1.3	94.8 ± 2.0	94.8 ± 2.0
Aortic insufficiency†	99.7 ± 0.3	99.6 ± 0.4	93.2 ± 2.0	90.7 ± 2.6	78.0 ± 4.8
Mitral insufficiency‡	100	99.2 ± 0.6	92.8 ± 2.1	88.8 ± 3.5	88.8 ± 3.5
Thromboembolism§	99.5 ± 0.4	96.6 ± 1.0	94.1 ± 1.5	92.2 ± 2.4	90.1 ± 3.2
Valve-related event‖	98.1 ± 0.6	95.5 ± 1.1	91.2 ± 2.4	85.5 ± 3.8	79.4 ± 4.6

David et al. JTCVS 2014

VALVE-RELATED COMPLICATIONS

Reported Outcome After Valve-Sparing Aortic Root Replacement for Aortic Root Aneurysm: A Systematic Review and Meta-Analysis

Bardia Arabkhani, MD, Aart Mookhoek, MD, Isabelle Di Centa, MD, Emmanuel Lansac, MD, PhD, Jos A. Bekkers, MD, PhD, Rob De Lind Van Wijngaarden, MD, PhD, Ad J. J. C. Bogers, MD, PhD, and Johanna J. M. Takkenberg, MD, PhD

Variable	Pooled Data	Range	Included Studies (n)
Total patient number	4.777	32–430	31
Surgical period	1988–2012		31
Mean age (years)	51.0	29–63	30
Gender, male (%)	71.0	57%–85	30
Comorbidity			
Connective tissue disease (%)	23.9	0–100	35
Severe aortic regurgitation (%)	46.1	6.4–100	25
Bicuspid aortic valve (%)	14.1	0–33	28
Prior cardiac operation (%)	4.49	2–12	14
Other indications			
Acute type A dissection (%)	10.5	0–33	28

Arabkhani et al. ATS 2015

VALVE-RELATED COMPLICATIONS

Reported Outcome After Valve-Sparing Aortic Root Replacement for Aortic Root Aneurysm: A Systematic Review and Meta-Analysis

Bardia Arabkhani, MD, Aart Mookhoek, MD, Isabelle Di Centa, MD, Emmanuel Lansac, MD, PhD, Jos A. Bekkers, MD, PhD, Rob De Lind Van Wijngaarden, MD, PhD, Ad J. J. C. Bogers, MD, PhD, and Johanna J. M. Takkenberg, MD, PhD

Table 2. Linearized Occurrence Rates of Late Outcome Events

Pooled Late Outcome Events	LOR + 95% CI	Heterogeneity (I^2)	Included Studies (n)	Events (n)	Patient Years (n)
Late mortality	1.53 (1.19–1.96)	82.6	31	262	21,274
Reoperation on aortic valve	1.32 (1.0–1.74)	72.3	31	228	21,274
Hemorrhage	0.23 (0.13–0.42)	78.7	26	15	19,158
Thromboembolism	0.41 (0.22–0.77)	27.6	26	42	19,158
Endocarditis	0.23 (0.11–0.51)	0.00	30	29	20,930
MAVRE	1.66 (1.24–2.23)	100	20	300	19,158

Arabkhani et al. ATS 2015

QUALITY OF LIFE

QUALITY OF LIFE

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]

TABLE 1. Patient characteristics

	No.	Sex (male/female)	Age at operation (y, mean ± SD)	Age at survey (y, mean ± SD)
AV REPAIR	Group I	87	63:24	38 ± 6	40 ± 6
MECHANICAL	Group II	40	35:5	40 ± 7	46 ± 7
ROSS	Group III	39	27:12	40 ± 7	46 ± 7

Aicher et al. JTCVS 2011

QUALITY OF LIFE

Valve-specific questions	Group I	Group II	Group III	*P* value
1. If I had to do it over again, would I make the same decision to have surgery?				
Yes	94.0%	89.7%	100.0%	.821
I don't know	3.6%	7.7%	0.0%	
No	2.4%	2.6%	0.0%	
2. Is there a valve sound that bothers me?				
Never/rarely	91.5%	41.0%	92.4%	<.001
Occasionally	6.1%	33.3%	5.1%	
Frequently/always	2.4%	25.7%	2.5%	
3. Following my valve surgery, the frequency of doctor visits and blood tests bothers me.				
Never/rarely	75.9%	61.6%	84.2%	.011
Occasionally	20.5%	17.9%	13.2%	
Frequently/always	3.6%	20.5%	2.6%	
4. The possibility of complications due to my implanted valve concerns me.				
Never/rarely	48.2%	48.7%	61.5%	.309
Occasionally	43.4%	30.8%	33.3%	
Frequently/always	8.4%	20.5%	5.2%	
5. I am concerned about possible bleeding caused by my anticoagulant medication.				
Never/rarely	80.5%	43.6%	79.5%	<.001
Occasionally	12.2%	15.4%	7.7%	
Frequently/always	7.3%	41.0%	12.8%	
6. I am afraid that my valve may fail.				
Never/rarely	53.7%	51.3%	76.9%	.036
Occasionally	34.1%	28.2%	17.9%	
Frequently/always	12.2%	20.5%	5.2%	
7. I am afraid that I may need another valve operation.				
Never/rarely	38.0%	48.7%	53.8%	.382
Occasionally	45.0%	25.6%	25.6%	
Frequently/always	17.0%	25.7%	20.6%	

Aicher et al. JTCVS 2011

QUALITY OF LIFE

Quality of life after aortic valve repair is similar to Ross patients and superior to mechanical valve replacement: a cross-sectional study

Pavel Zacek[1*†], T. Holubec[2†], M. Vobornik[1], J. Dominik[1], J. Takkenberg[3], J. Harrer[1] and J. Vojacek[1]

Conclusions: Postoperative quality of life is influenced by the type of aortic valve procedure and is negatively linked with mechanical prosthesis implantation and long-term anticoagulation. Aortic valve-sparing strategy should be considered in cases with suitable valve morphology due to favorable clinical results and beneficial impact on the long-term quality of life.

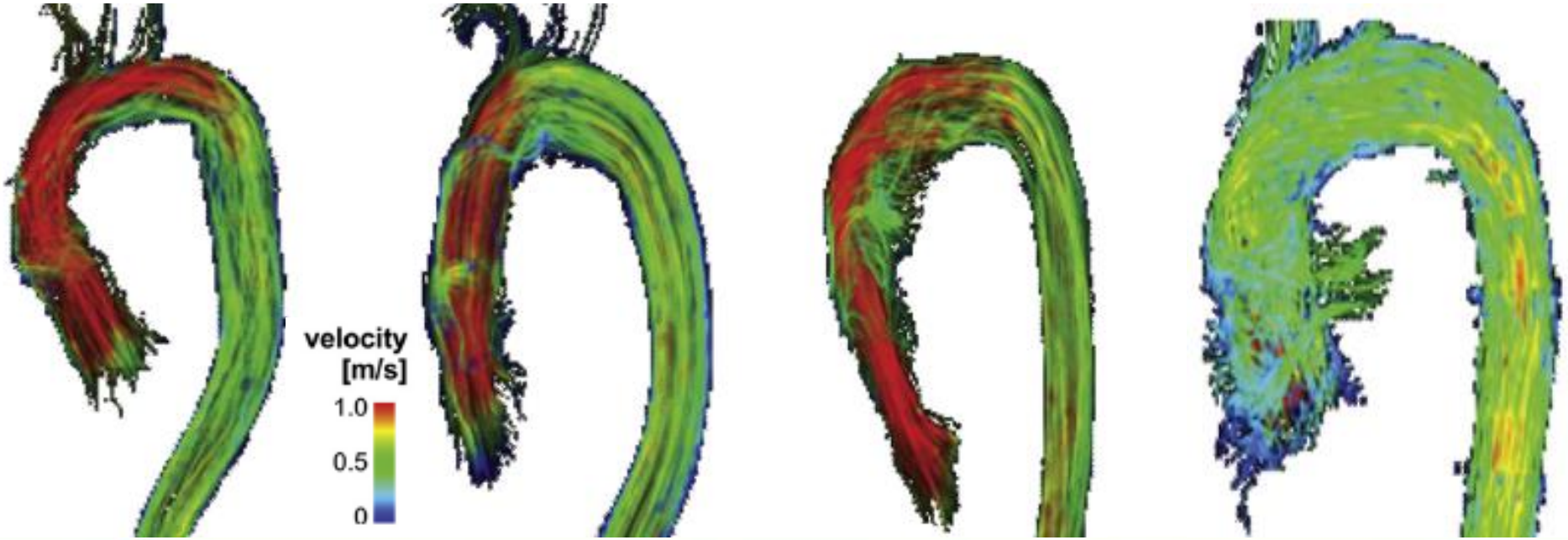
Zacek et al. BMC Cardiovasc Dis 2016

HEMODYNAMICS

HEMODYNAMICS

Comparison of Hemodynamics After Aortic Root Replacement Using Valve-Sparing or Bioprosthetic Valved Conduit

Jeremy D. Collins, MD, Edouard Semaan, MD, Alex Barker, PhD, Patrick M. McCarthy, MD, James C. Carr, MD, Michael Markl, PhD, and S. Chris Malaisrie, MD



Collins et al. ATS 2015

HEMODYNAMICS

Comparison of Hemodynamics After Aortic Root Replacement Using Valve-Sparing or Bioprosthetic Valved Conduit

Background. The purpose of this study is to compare aortic hemodynamics and blood flow patterns using in-

second, $p < 0.005$). Flow asymmetry in BIO-ARR was increased compared with VSARR, evidenced by more

Conclusions. **The VSARR results in improved hemodynamic outcomes when compared with BIO-ARR, as indicated by reduced peak velocities in the aortic root and less helix flow in the AAo by 4D flow MRI. Longitudinal research assessing the clinical impact of these differences in hemodynamic outcomes is warranted.**

the aortic root and AAo in both VSARR and BIO-ARR were elevated compared with controls (1.1 to 1.3m/

(Ann Thorac Surg 2015;100:1556–62)

Collins et al. ATS 2015

AORTIC VALVE REPAIR

WHEN?

To Preserve or Not to Preserve?

The **DECISION** depends on

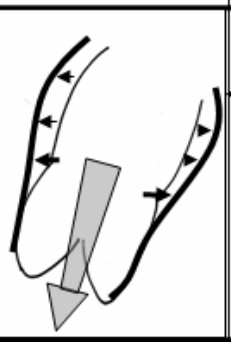
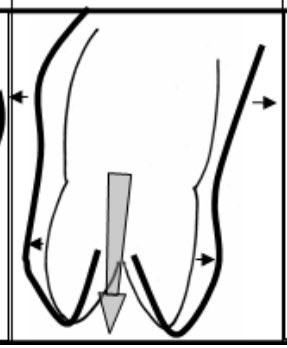
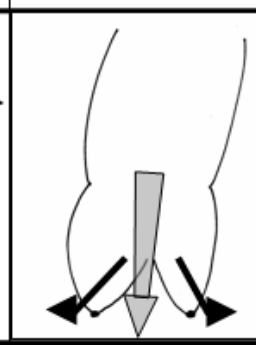
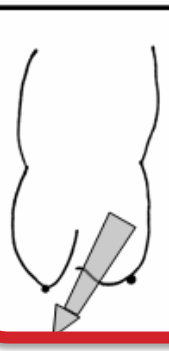
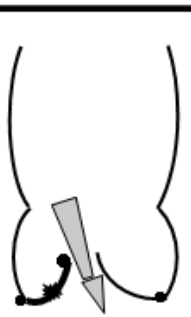
- **FEASIBILITY**
- **EXPECTED DURABILITY**

The **EVALUATION** rests on

- **PREOP IMAGING**
- **INTRAOP ASSESSMENT**

Improved Understanding of AI in BAV

MECHANISMS OF AI

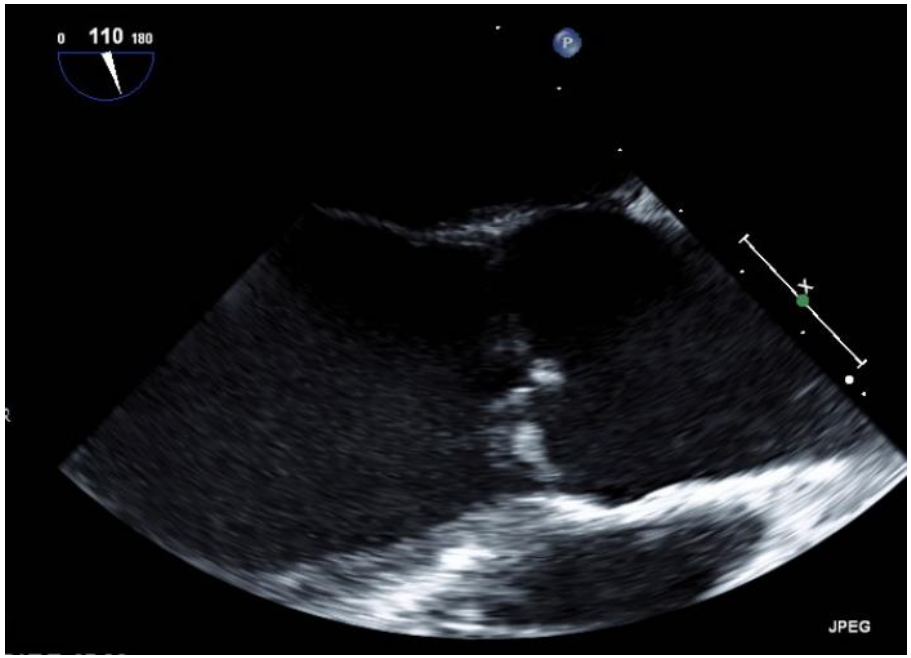
AI Class	Type I Normal cusp motion with Functional Aortic Annulus dilatation			Type II Cusp Prolapse	Type III Cusp Restriction
	Ia	Ib	Ic		
Mechanism					

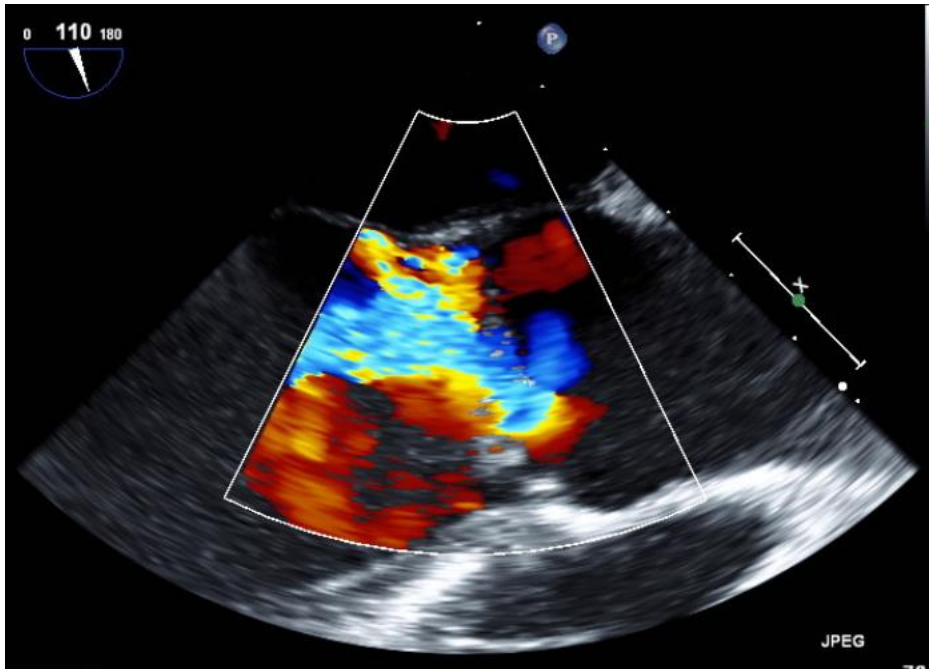
THE MOST COMMON MECHANISM IN BAV

Improved Understanding of AI in BAV

MECHANISMS OF AI

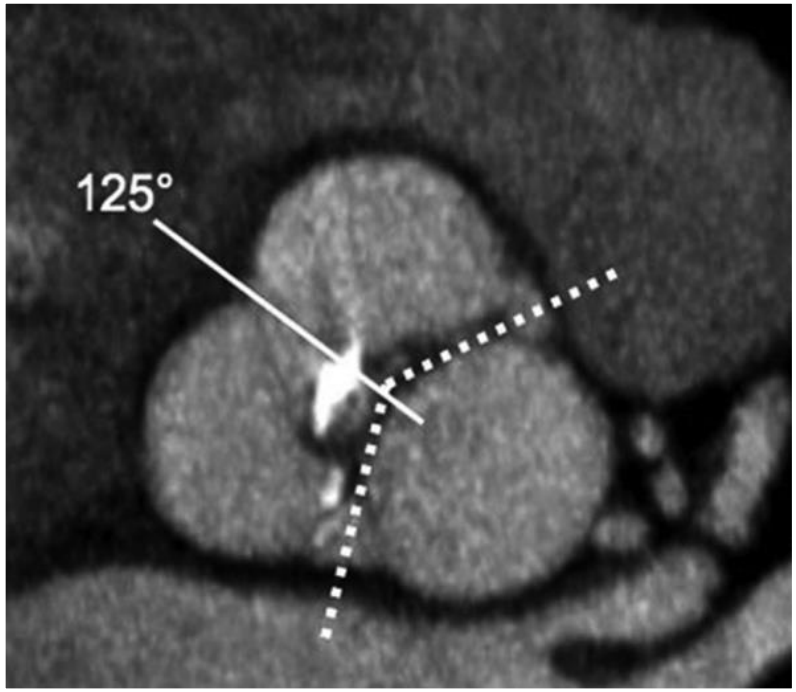
Prolapse of the fused cusp





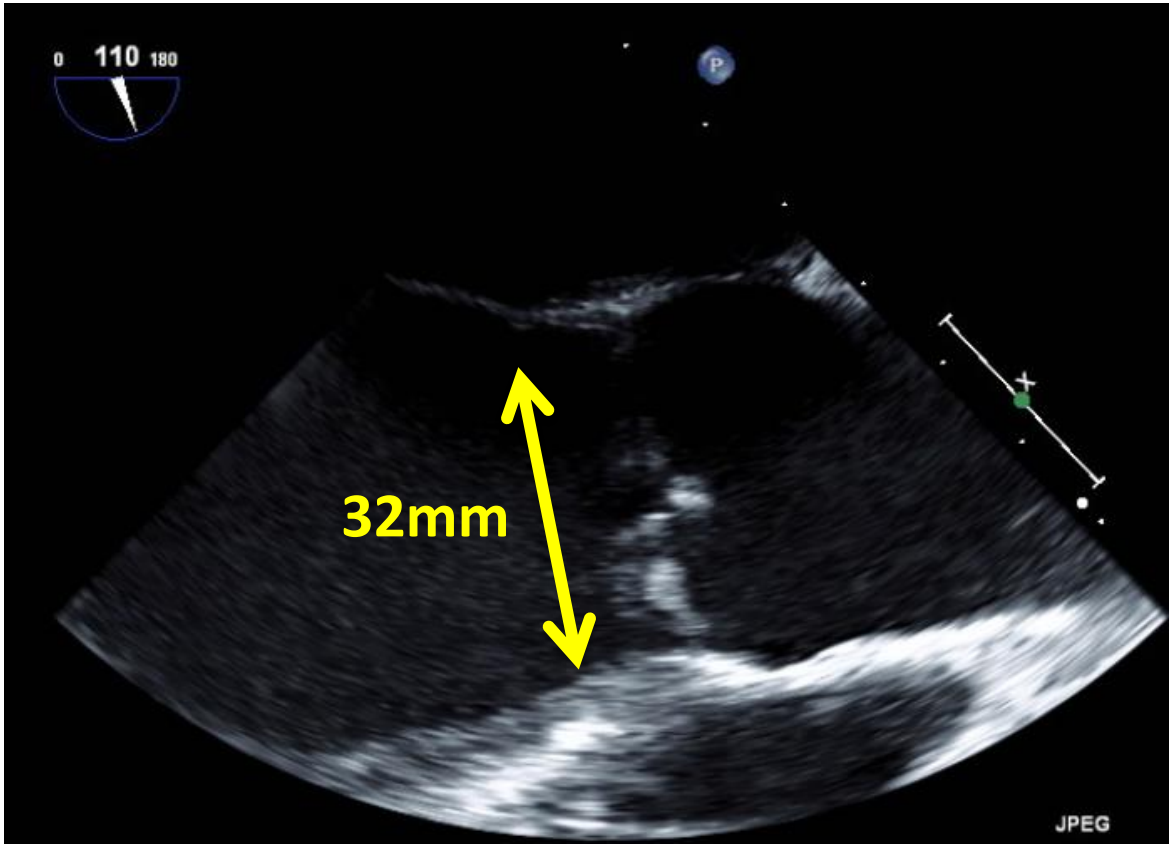
Improved Understanding of AI in BAV

COMMISSURAL ORIENTATION



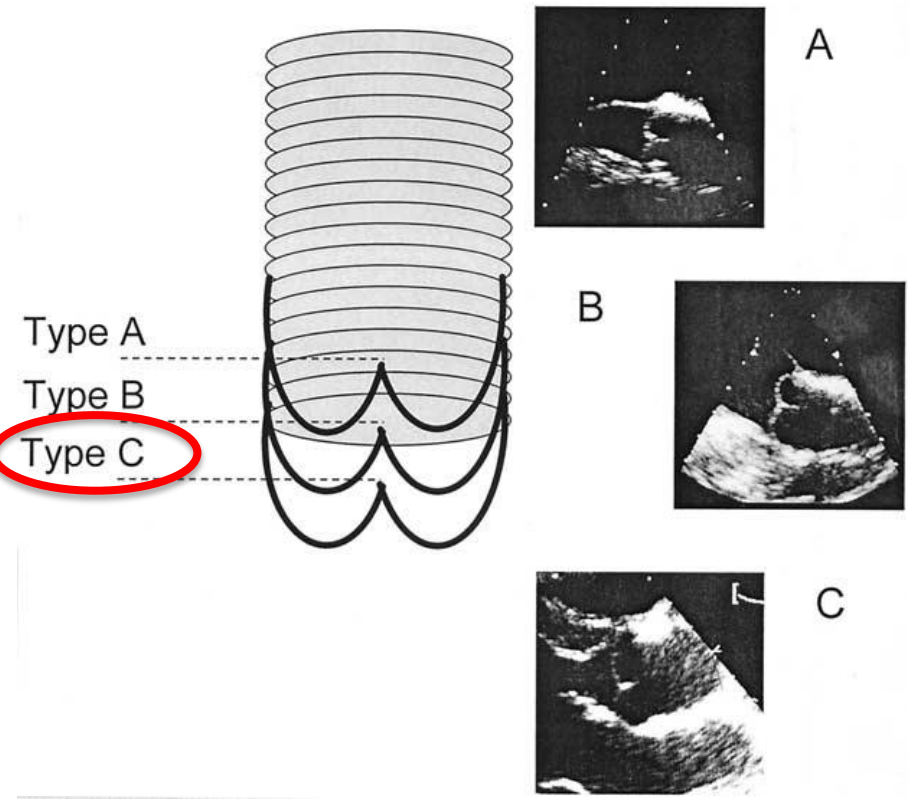
Improved Understanding of AI in BAV

ANNULAR DILATATION

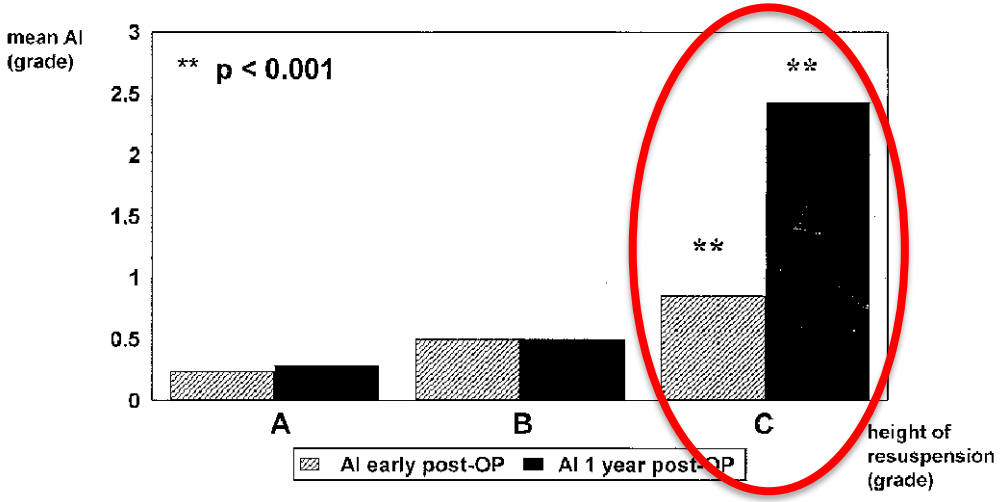


IMPROVEMENTS IN SURGICAL TECHNIQUE

RELEVANCE OF CUSP PROLAPSE



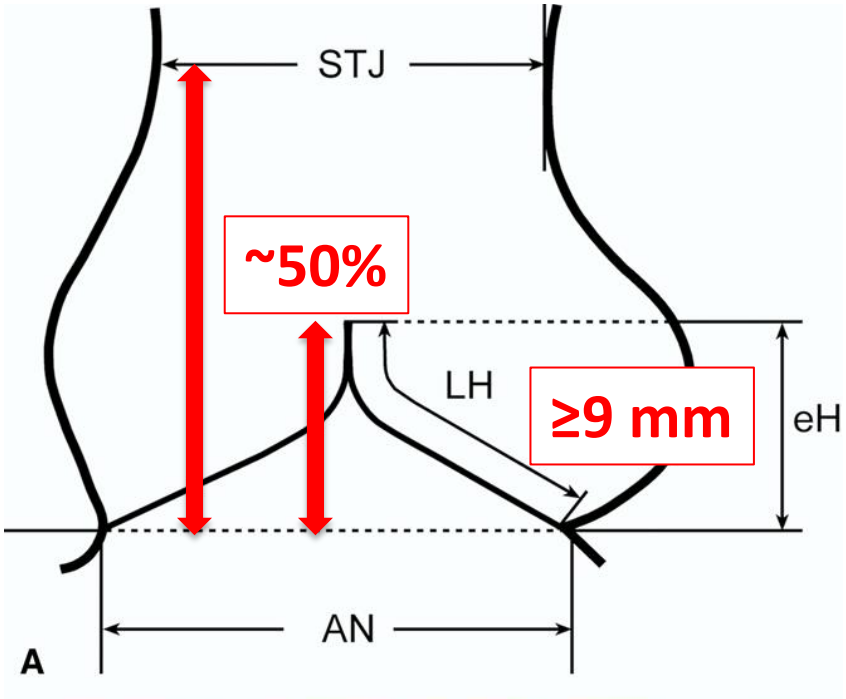
AI at 1 year

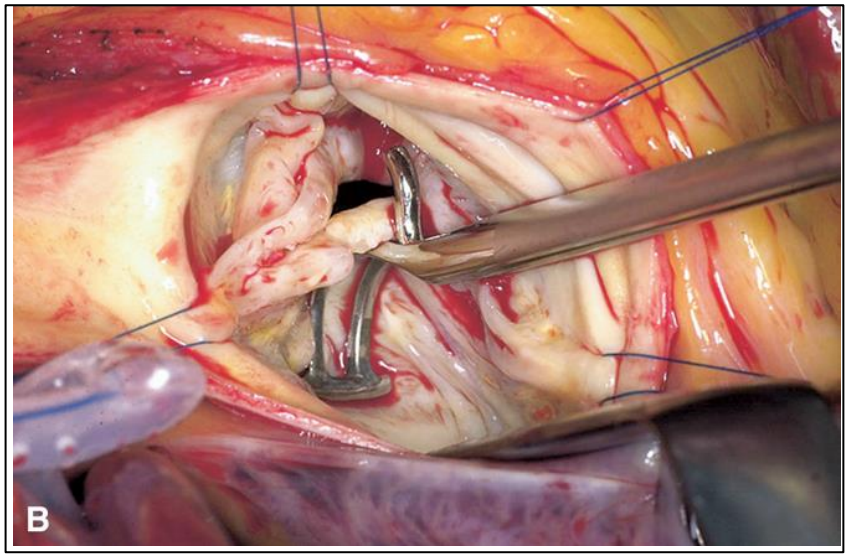


Pethig et al. Ann Thorac Surg 2002

RELEVANCE OF CUSP PROLAPSE

EFFECTIVE HEIGHT

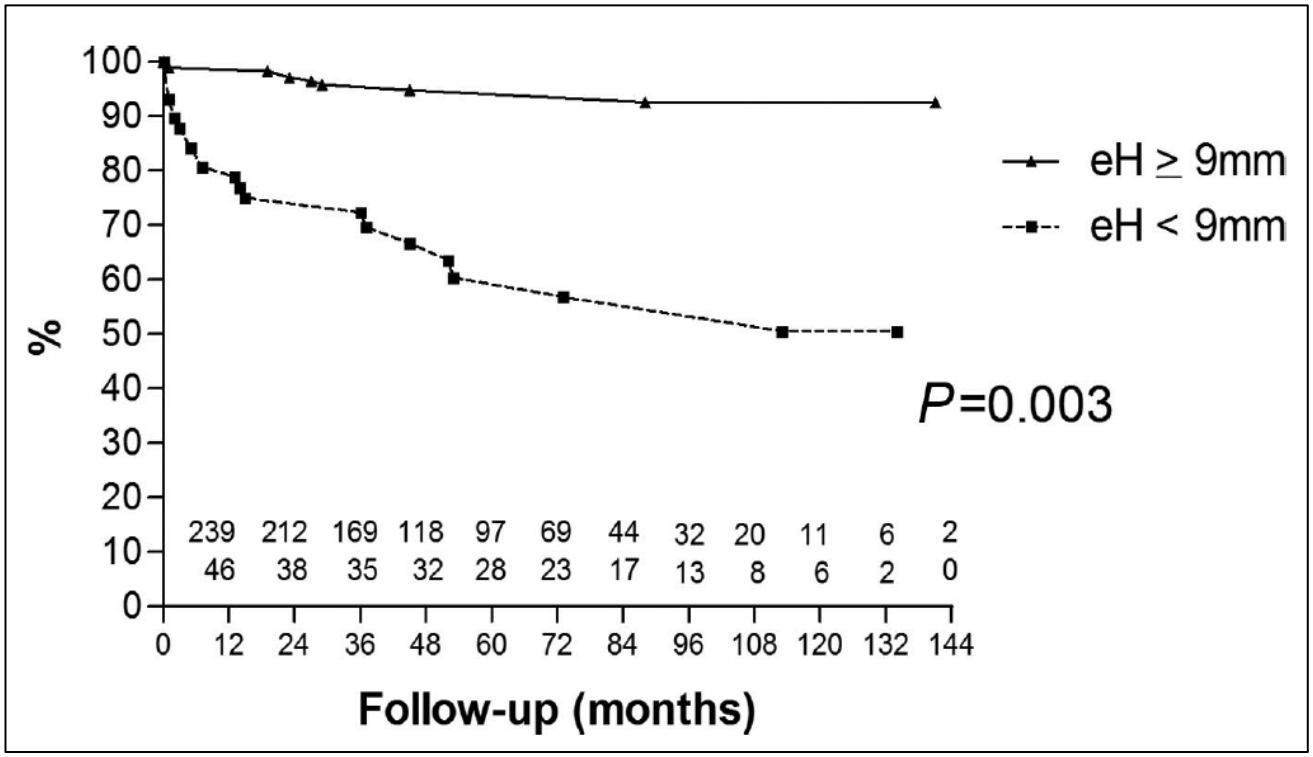




Schafers. J Thor Cardiovasc Surg 2006

RELEVANCE OF CUSP PROLAPSE

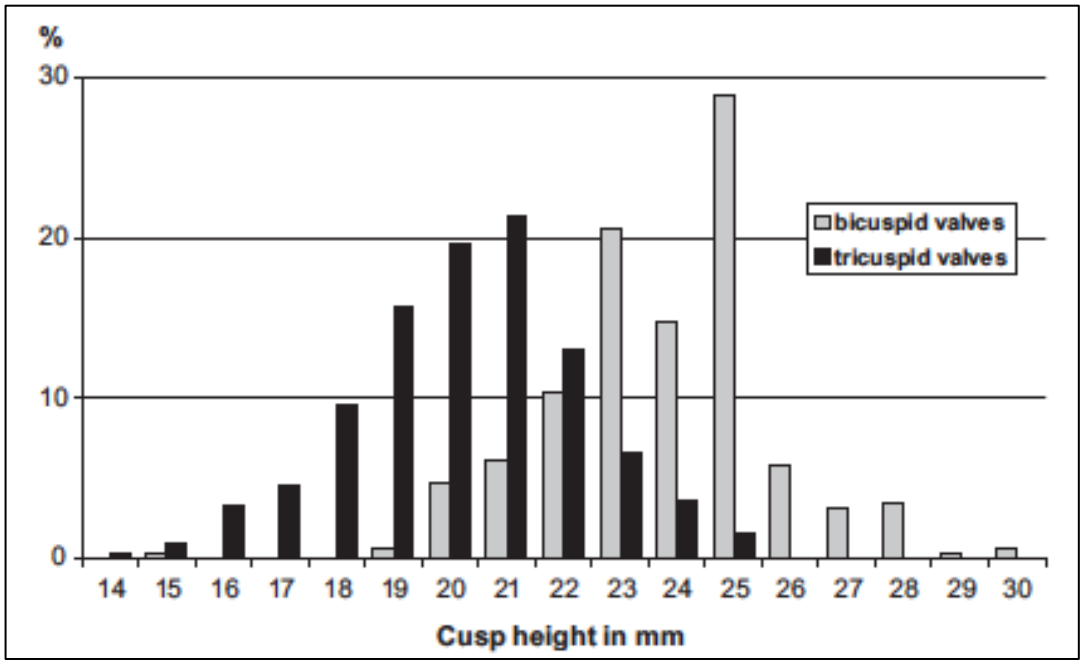
EFFECTIVE HEIGHT

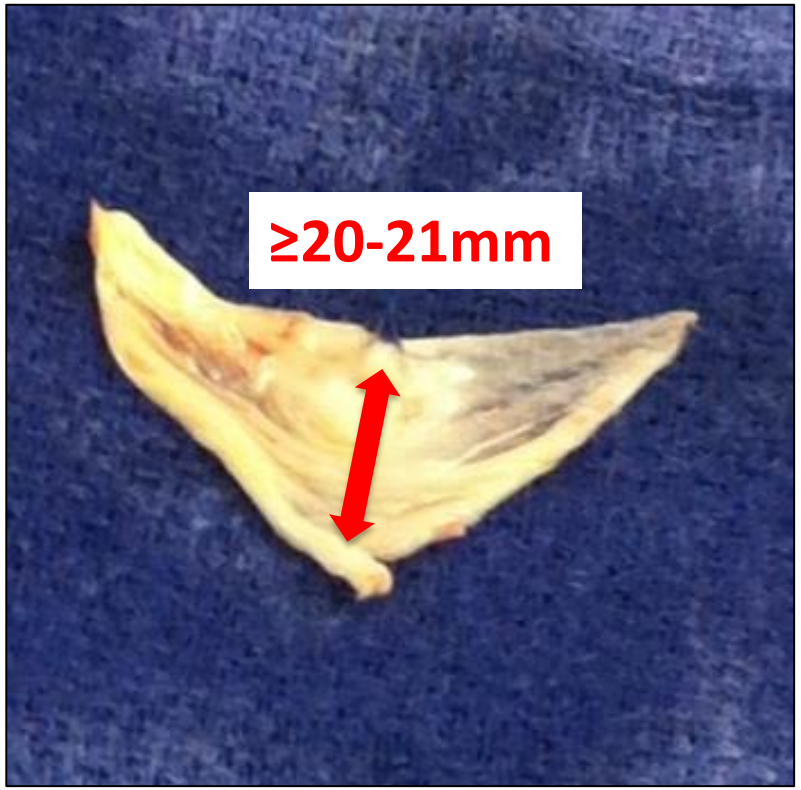


Aicher et al. Circulation 2011

CUSP RETRACTION

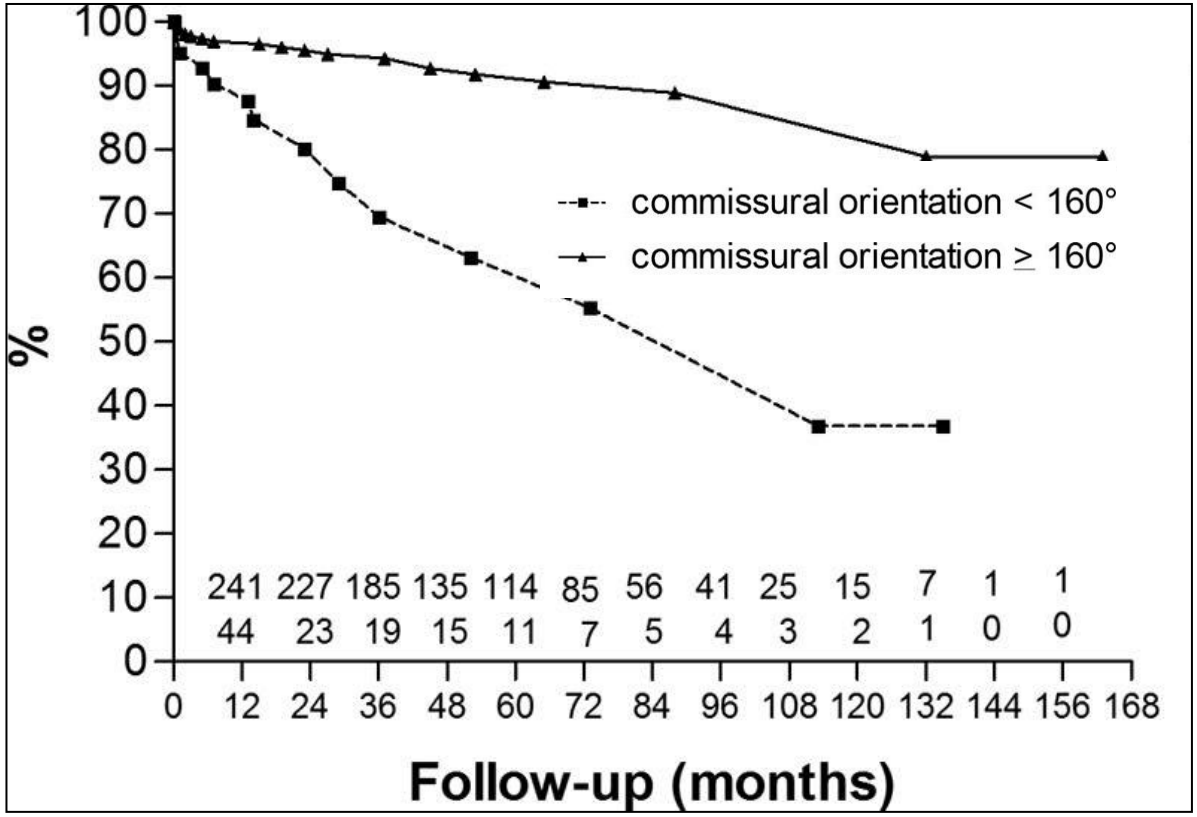
GEOMETRIC HEIGHT





Schafers et al. JTCVS 2013

COMMISSURAL ORIENTATION



Aicher et al. Circulation 2011

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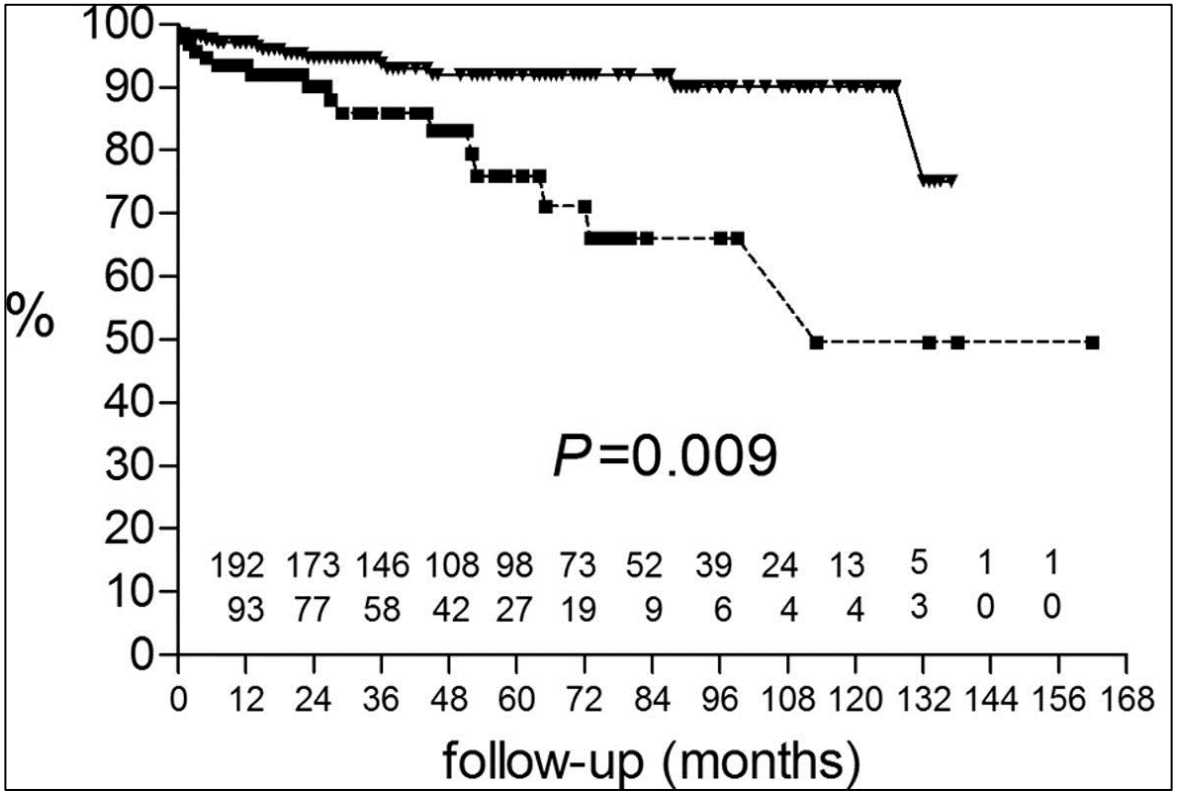
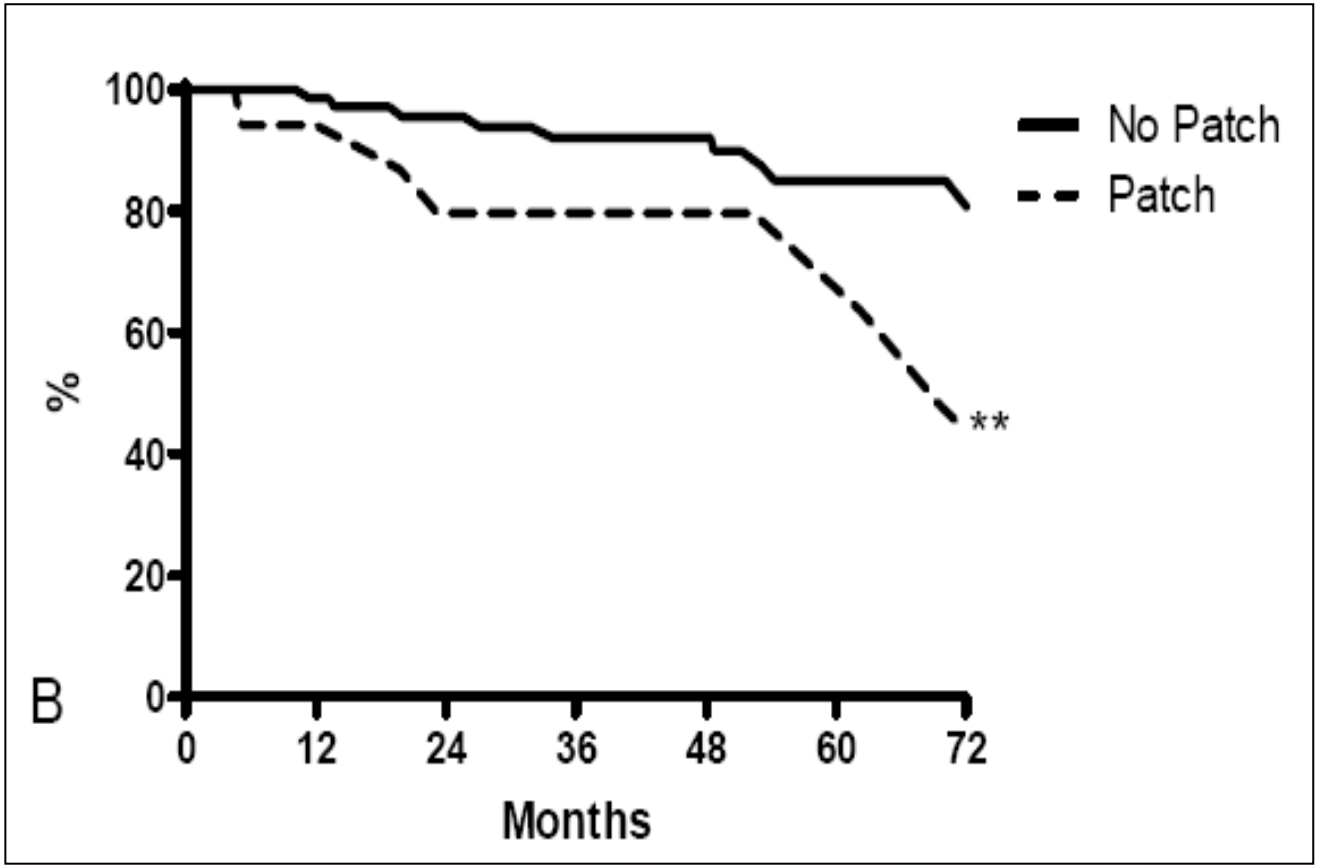
ROLE OF AORTIC ANNULOPLASTY



Aicher et al. Circulation 2011

CUSP REPAIR TECHNIQUES

AVOIDANCE OF PATCH REPAIR



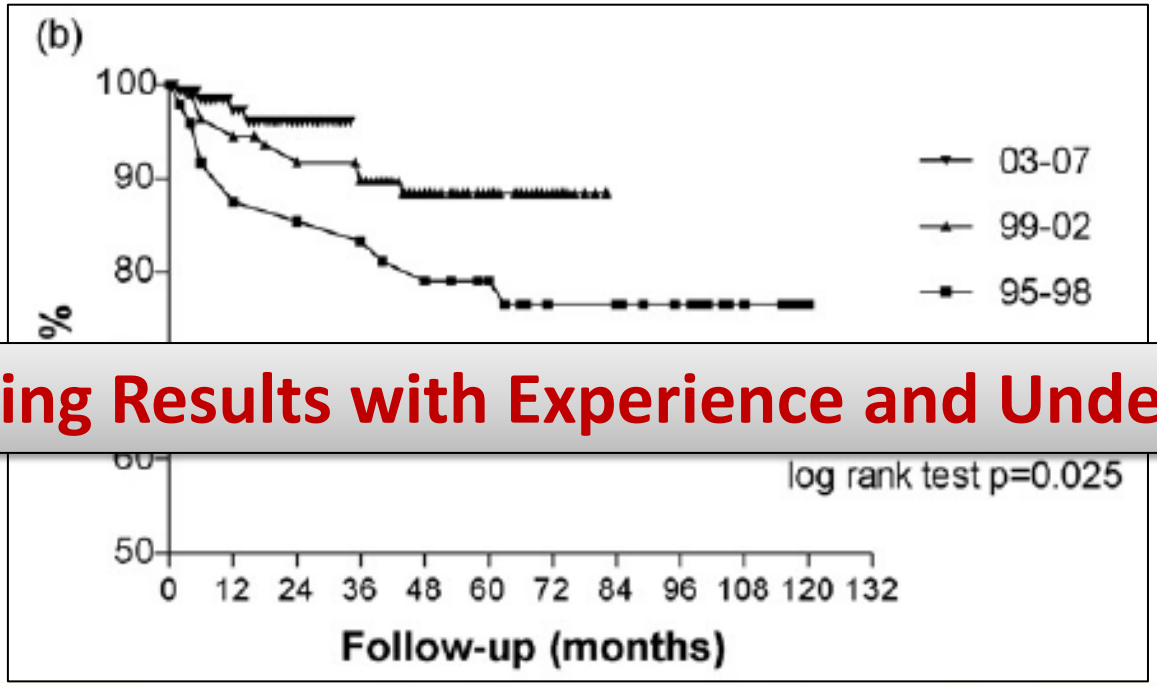
Boodhwani et al. JTCVS 2010

AV Repair Durability

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

Diana Aicher [a], Roland Fries [b], Svetlana Rodionycheva [a], Kathrin Schmidt [a], Frank Langer [a], Hans-Joachim Schäfers [a,*]

Freedom from AR ≥ II



Improving Results with Experience and Understanding

Aicher et al. EJCTS 2010

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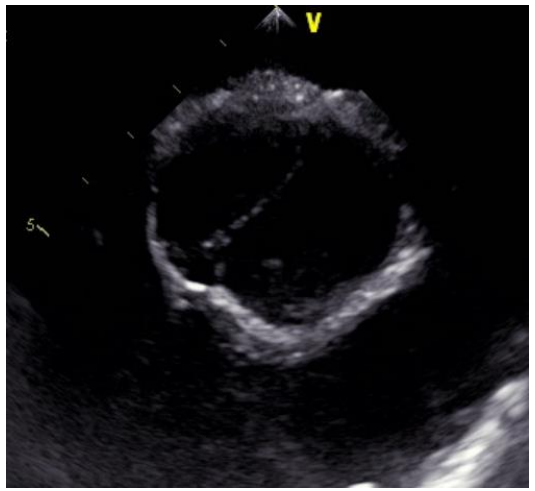
Favorable ECHO Characteristics (BAV)

- **CUSPS**
  - Pliable
  - Little to no calcium
  - Sufficient length of coaptation

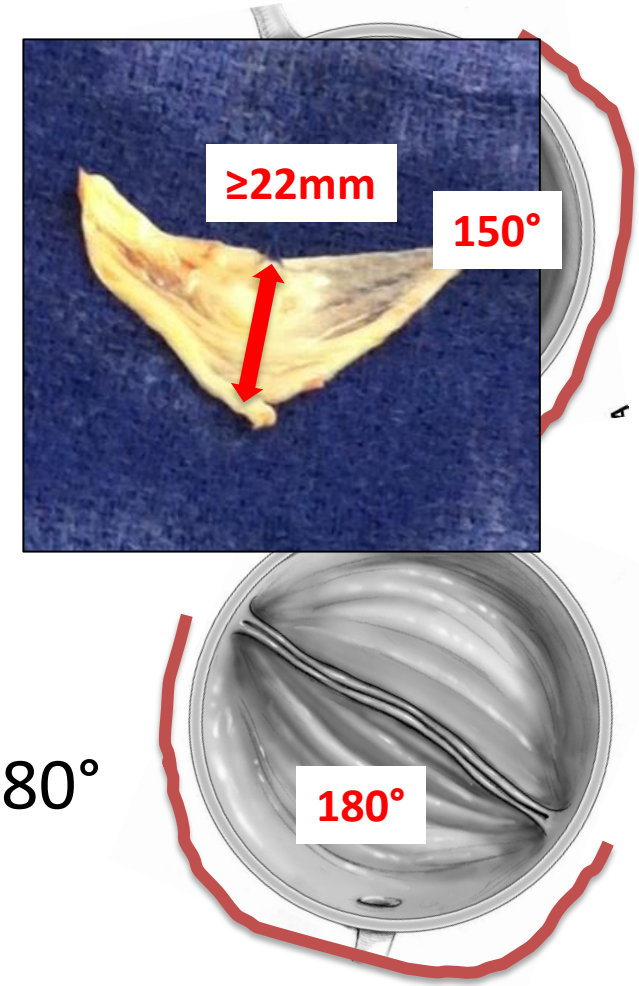
- **AORTIC ANNULUS**
  - <28mm



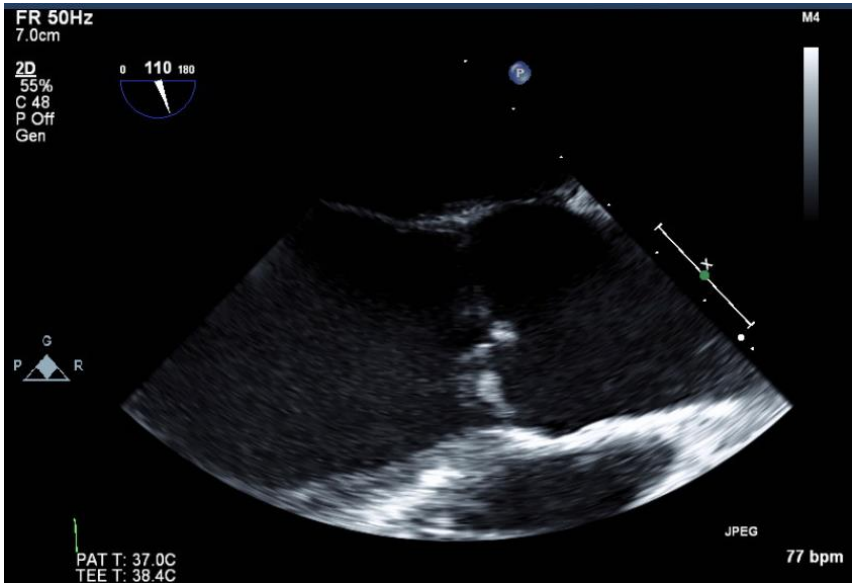
- **COMMISSURES**
  - Circumferential orientation 160-180°

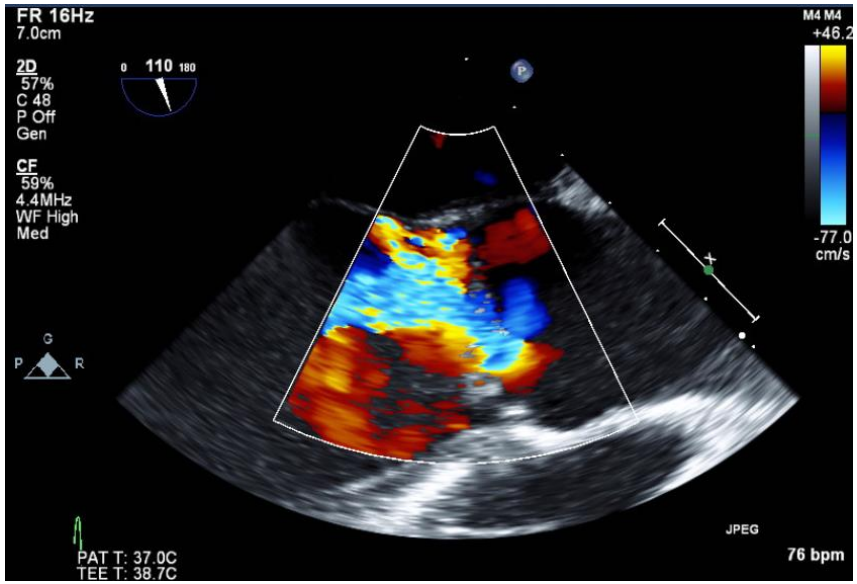
Favorable INTRAOP Characteristics (BAV)

- **CUSPS**
  - Pliable
  - Geometric height ≥21mm
  - Little to no calcium/fenestrations
- **COMMISSURES**
  - Circumferential orientation 160-180°



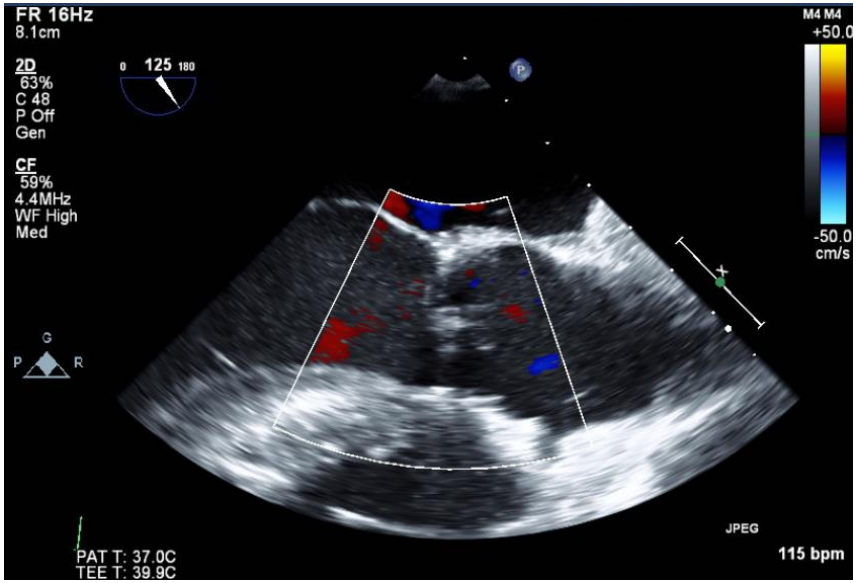
25 yo male with BAV (R-L fusion)
Severe eccentric AI with LV dilatation
Annulus = 30mm
Sinus = 39mm
STJ = 38mm

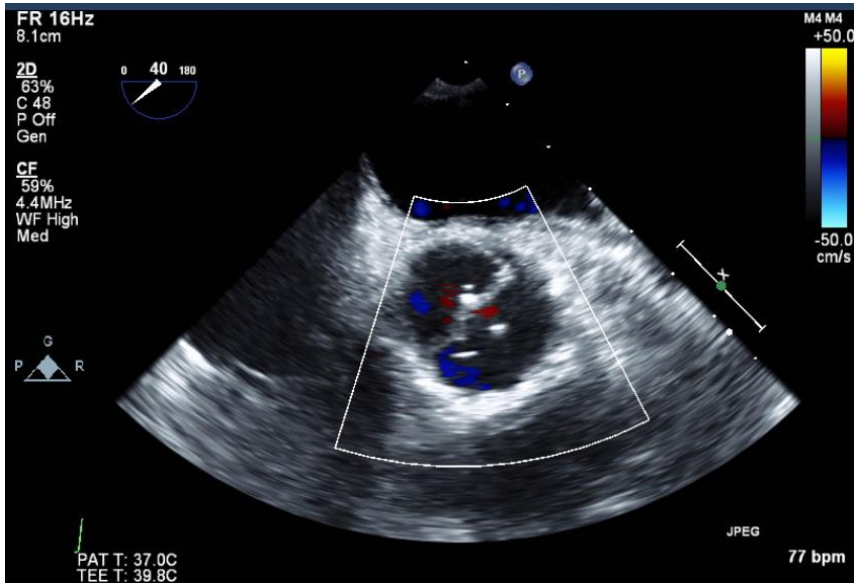




25 yo male with BAV (R-L fusion)
Severe eccentric AI with LV dilatation

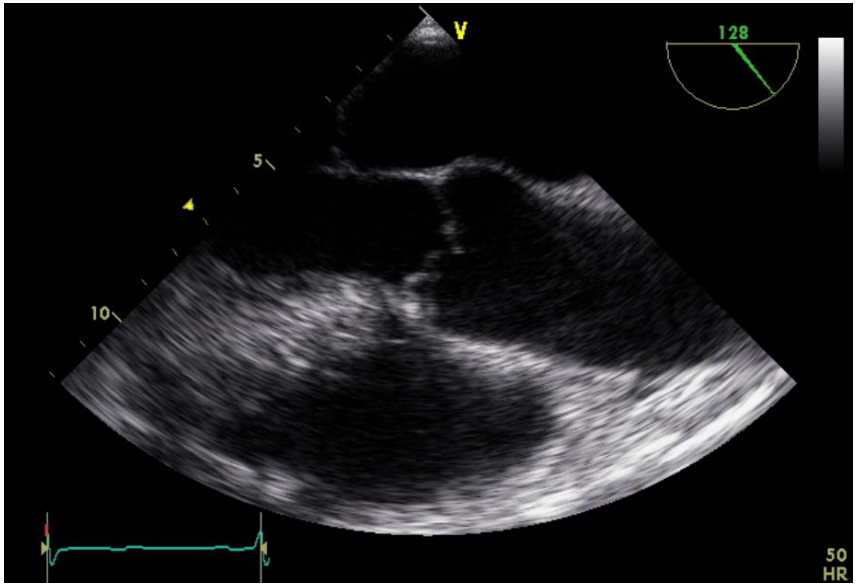
Subcoronary Annuloplasty ring
Restoration of effective height
STJ Tailoring

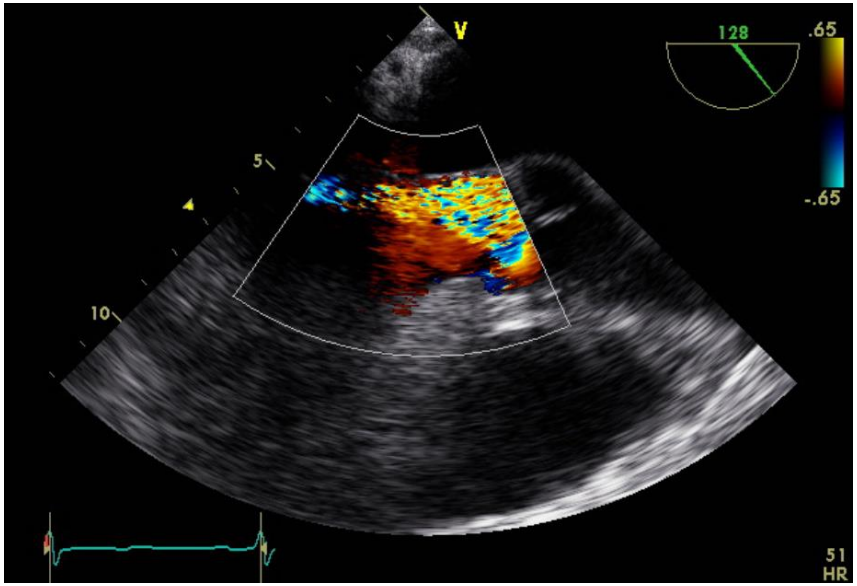




ICM-01-01-2012-08

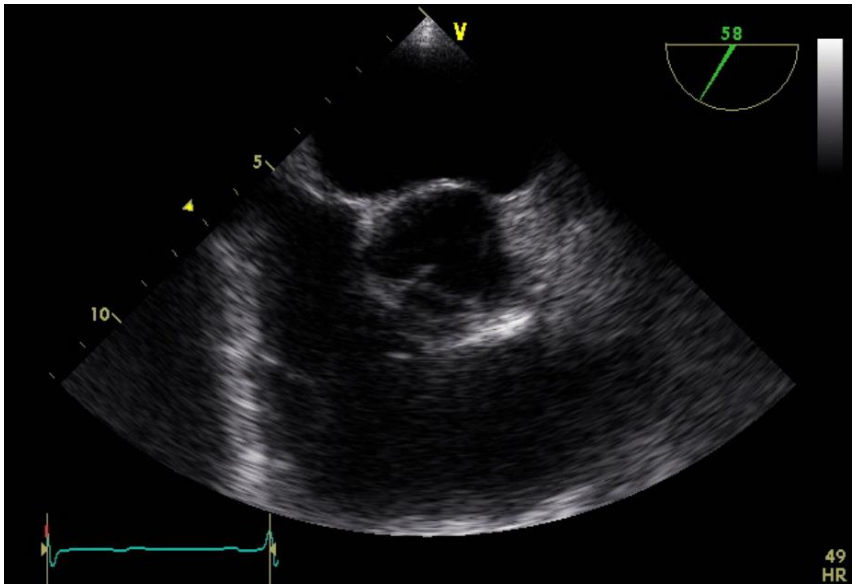
61 yo male with BAV (R-L fusion)
Severe AI with LV dilatation
Annulus = 28mm
Sinus = N
STJ = N

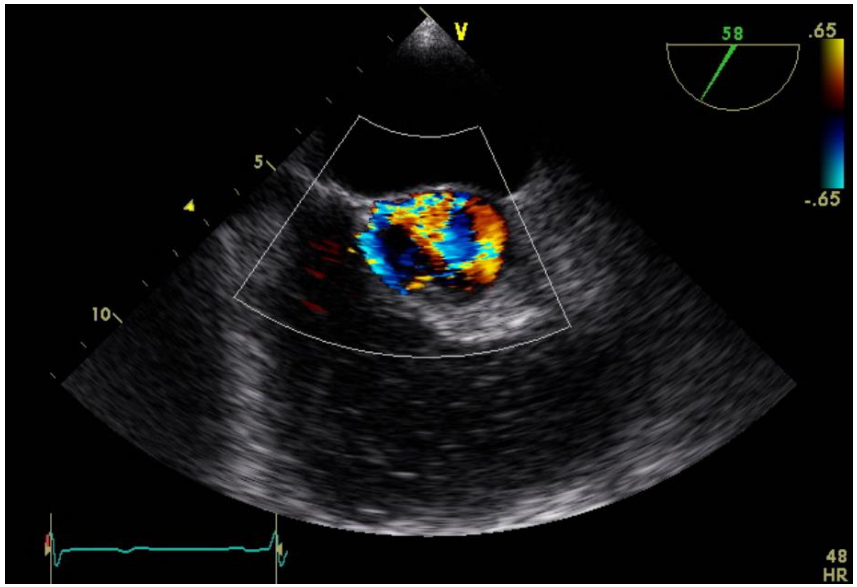




ICM-01-01-2012-08

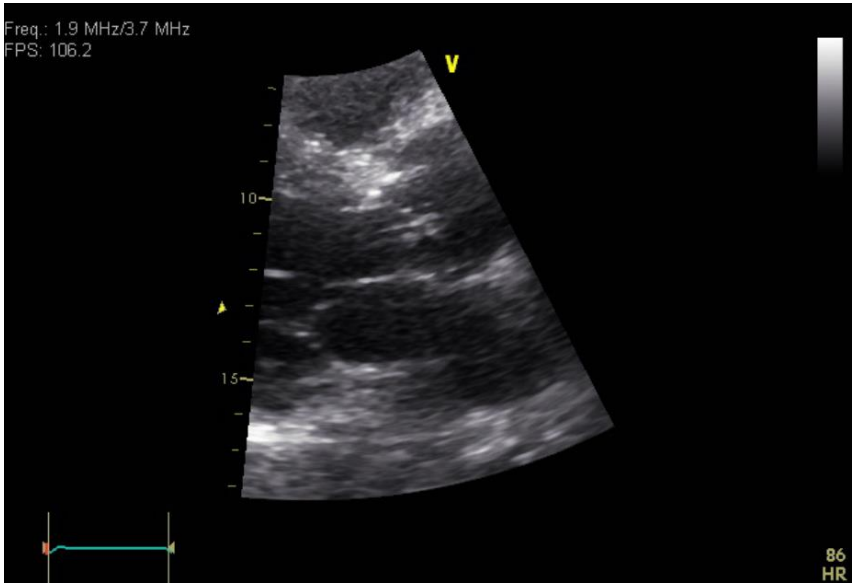
61 yo male with BAV (R-L fusion)
Severe AI with LV dilatation
Annulus = 28mm
Sinus = N
STJ = N

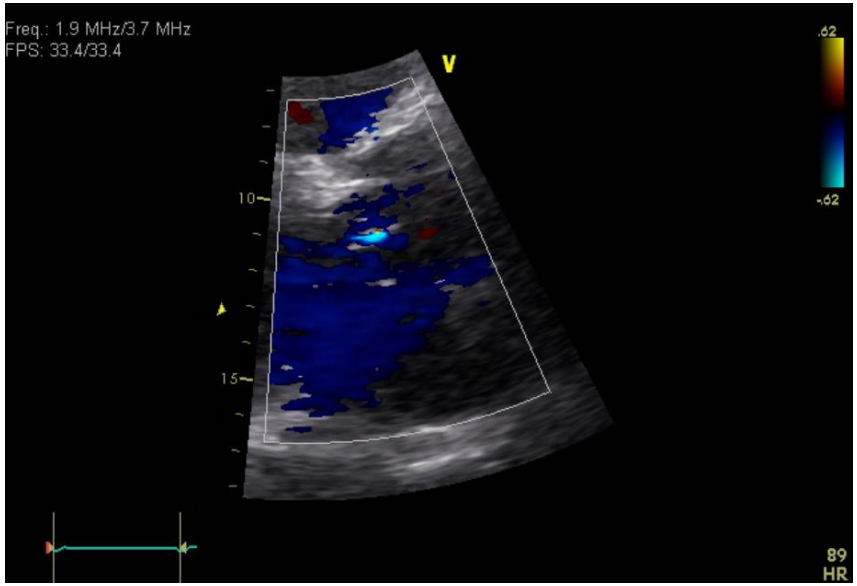




61 yo male with BAV (R-L fusion)
Severe AI with LV dilatation

Subcoronary Annuloplasty Ring
Extensive cusp effective plication to restore effective height

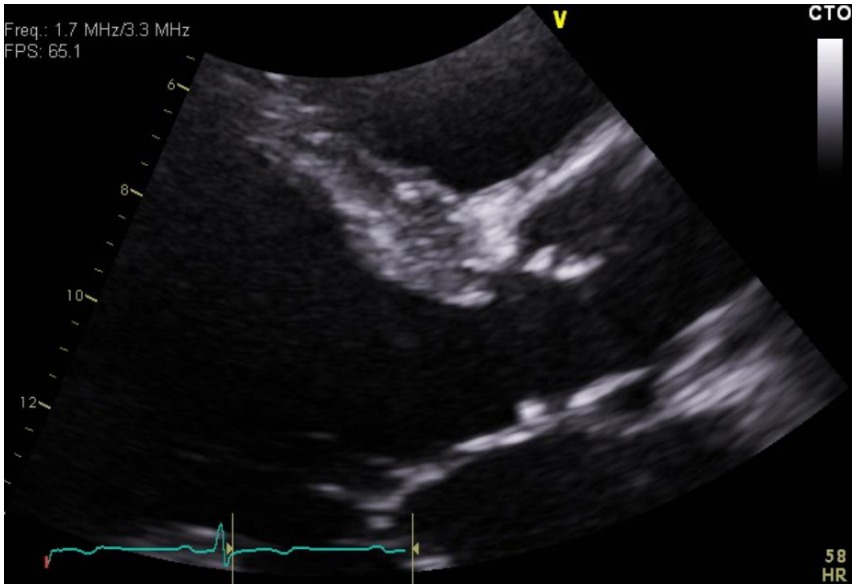


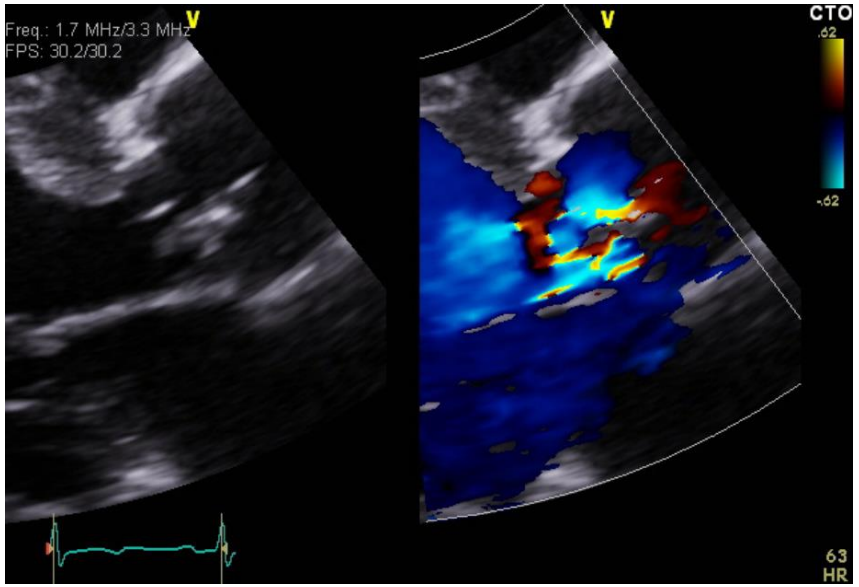


ICM-01-01-2012-08

61 yo male with BAV (R-L fusion)
Severe AI with LV dilatation

1 Year postop ⟶ Bioprosthetic AVR





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SUMMARY

AORTIC VALVE REPAIR

- ***WHY?***
  - Survival
  - Valve-related complications
  - Quality of life

- ***WHEN?***
  - Echo and intraop determination
  - Feasibility doesn't always mean durability – **JUDGEMENT**

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