Results of
Aortic Valve Preservation and Repair

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Institutional experience in AV preservation and repair

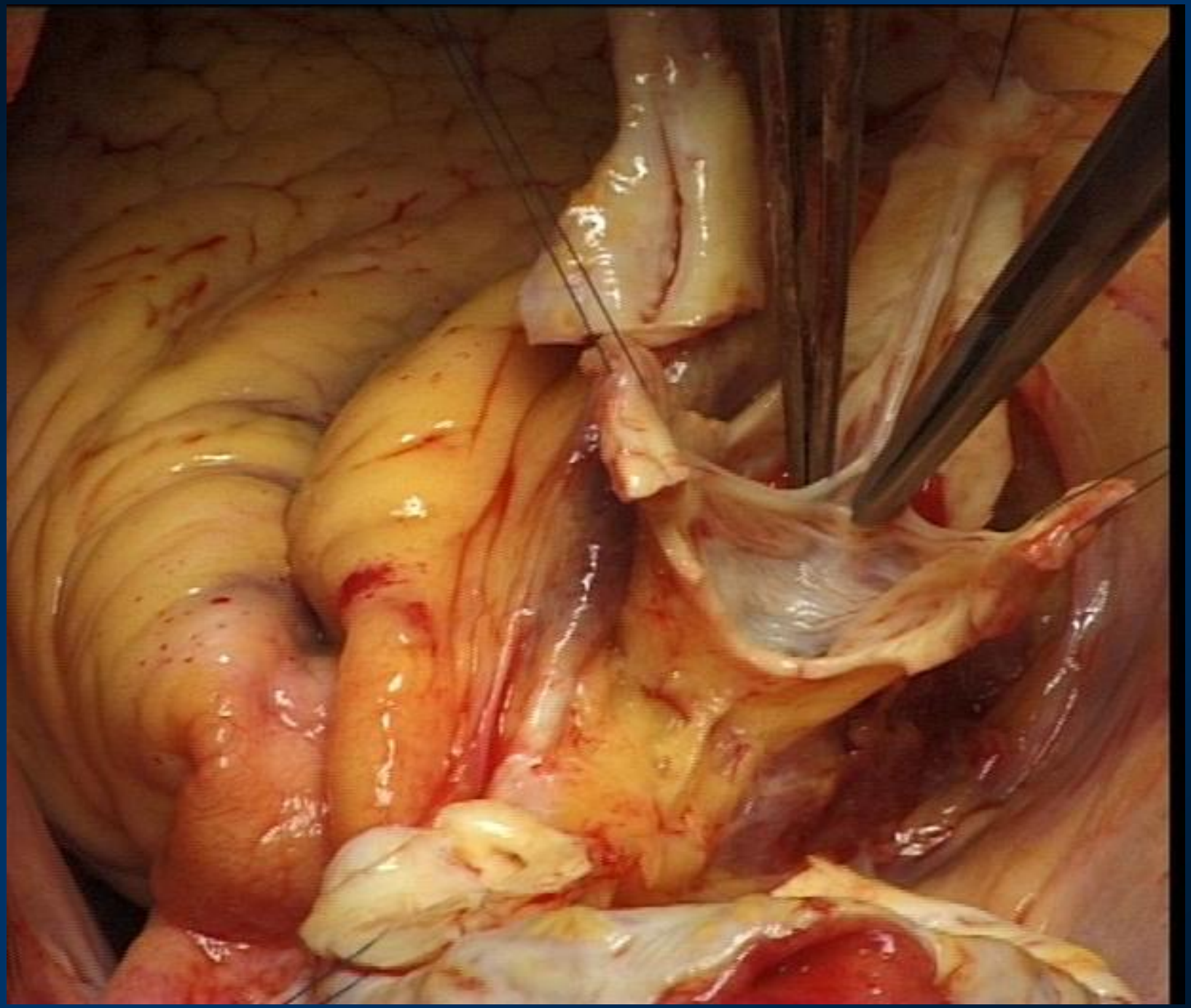
- Study cohort:

  → 475 consecutive patients

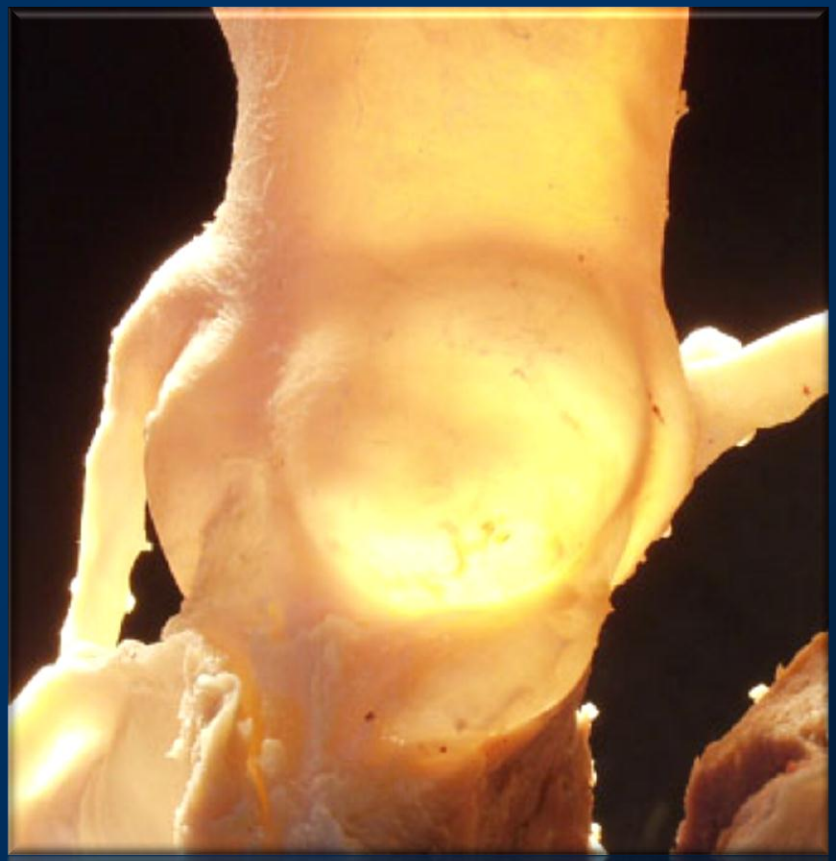
  - Elective AV repairs (1995-2010)
- Postoperative management:
  - Hospitatlisation: low dose of LMWH, Aspirin not systematically, Coumadin for other indication than AV repair,
  - FU: antiplatelet and anticoagulation at discretion of referent cardiologist
- Mean FU 5 years , 98% complete, 93% TT echo

Patients characteristics

Variable		n=475	
Age (years)		53 ± 16.1	76% ≤ 65 years
Male sex		386 (81.1%)	
NYHA class	I	187 (39.4%)	
	II	208 (43.8%)	
	≥ III	79 (16.6%)	
Prior Cardiac Surgery		47 (10%)	
Indication for surgery	AR	163 (34%)	
	Aortic aneurism	91 (19%)	
	AR + aortic aneurism	218 (46%)	
	other	3 (1%)	
Grade of AR	0 – 1+	93 (20%)	
	2+	109 (22%)	
	3+	275 (58%)	
AV morphology	Bicuspid	163 (34.3%)	
	Tricuspid	307 (64.6%)	
	Quadricuspid	5 (1.1%)	
LVEF >50%		420 (88.4%)	

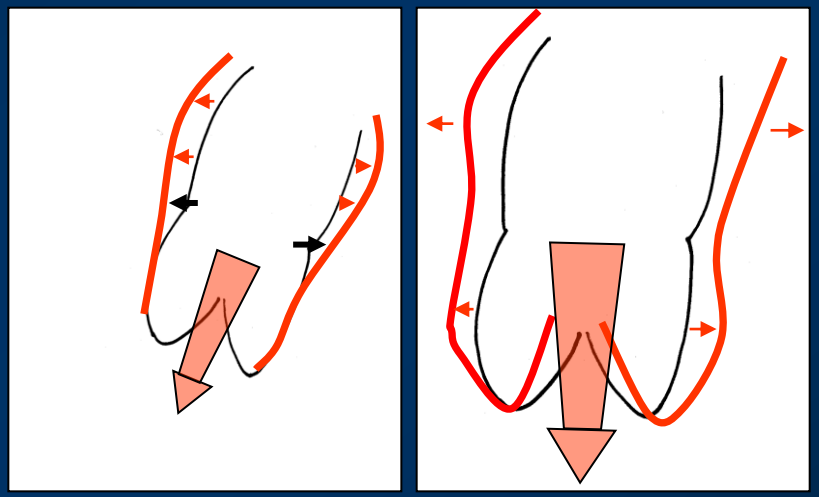


The Functional Aortic Annulus

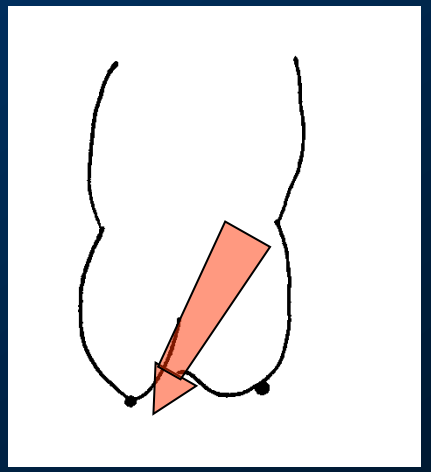


Pathophysiology of AR

- FAA Pathology: Dilation



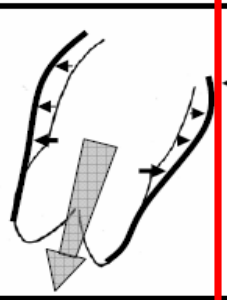
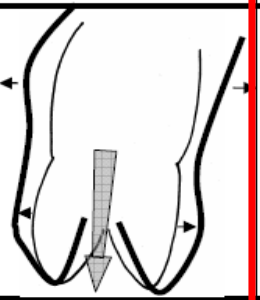
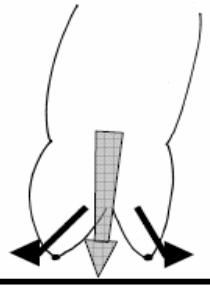
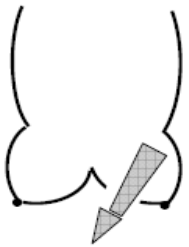
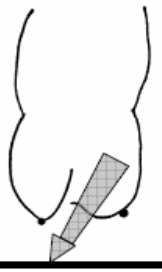
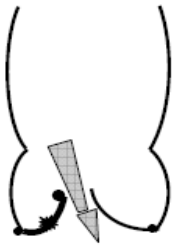
- Cusp Pathology: Prolapse or Restriction



Classification of Aortic Insufficiency

- Apply to all anatomic subtypes of AI
- Provide a standard communication tool between cardiologists, surgeons, anesthesiologists
- Guide the potential surgical treatment
- Assess the long-term efficacy of different types of surgical repair

Repair-Oriented Classification of Aortic Insufficiency

AI Class	Type I Normal cusp motion with FAA dilatation or cusp perforation				Type II Cusp Prolapse	Type III Cusp Restriction
	Ia	Ib	Ic	Id		
Mechanism						
Repair Techniques (Primary)	STJ remodeling *Ascending aortic graft*	Aortic Valve sparing: *Reimplantation or Remodeling with SCA*	SCA	Patch Repair *Autologous or bovine pericardium*	Prolapse Repair *Plication* *Triangular resection* *Free margin Resuspension* *Patch*	Leaflet Repair *Shaving* *Decalcification* *Patch*
(Secondary)	SCA		STJ Annuloplasty	SCA	SCA	SCA

STJ – Sino-tubular Junction; SCA – Sub-Commissural Annuloplasty

JTCVS 2009;137:286-94

Fundamental Principles of Valve Repair

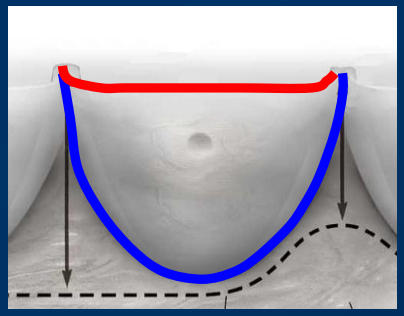
- Preserve or restore normal motion
- Create a large surface of coaptation

Leaflets

- Remodel and stabilize the annulus

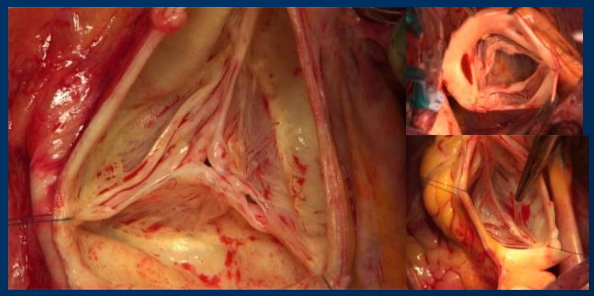
Close functional relationship (functional unit)

Fundamental Characteristics of Functional Unit



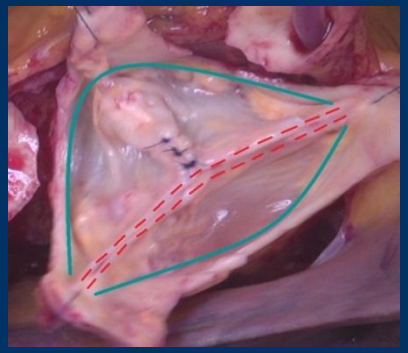
Leaflet motion

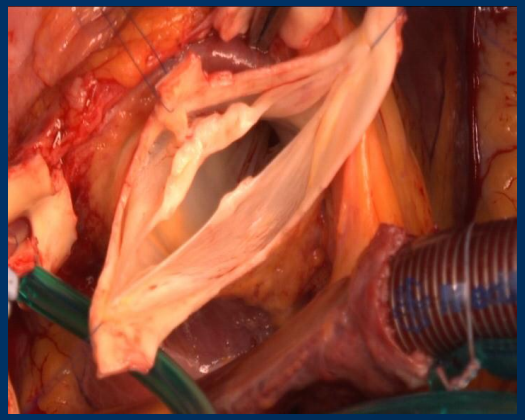
- Relationship between:
  Free Margin Length (FML) = Motion
  Insertion Length (IL)

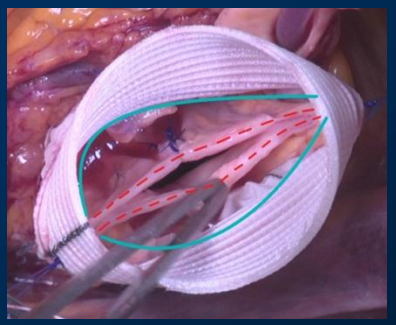


→ *Optimal for tricuspid > bicuspid > unicuspid*

Coaptation





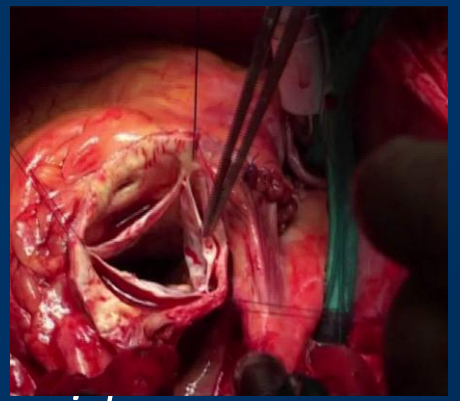


Annulus

- New Free Margin = shorter than Both Individual leaflet margins

- The annuloplasty should have an “selective “effect on the anterior part !!! The posterior, fibrosis easily moldable!!!

Fundamental Characteristics of Functional Unit

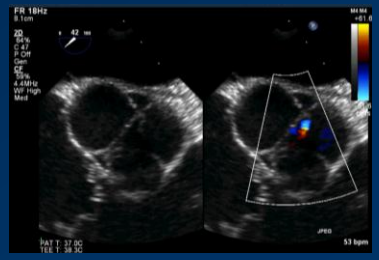


Leaflet motion and AVJ

Leaflet motion

Reduction of AVJ, annuloplasty, improrve motion wich compensates ***« gradient risk » mainly in BAV***

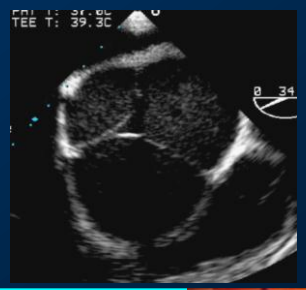
Coaptation



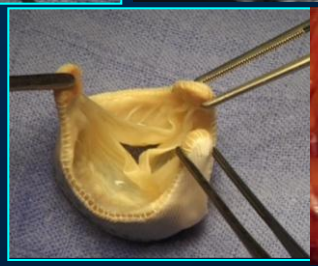
Leaflet motion and STJ:

Annulus

Dilation:restrictive motion



Overreduction: excess motion and prolaps



Small prosthesis or prosthesis not respecting the spatial commissural configuration

Fundamental Characteristics of Functional Unit

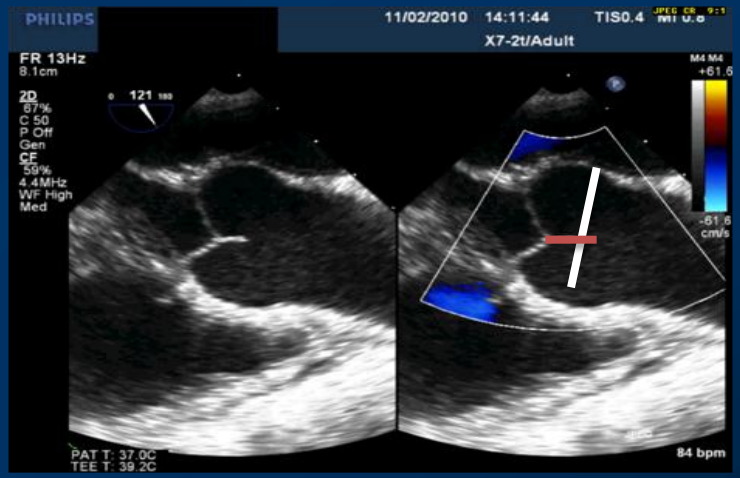
Coaptation: mid-sinus height, into aortic root

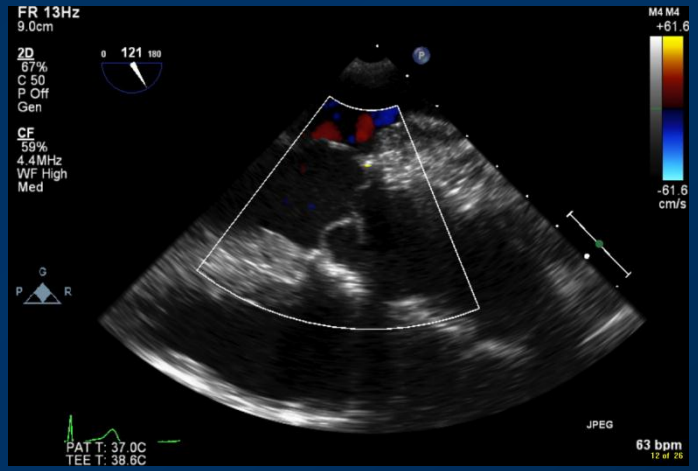
Leaflet motion

Coaptation

Annulus

Reserve of coaptation:
bigger the reserve,
more the dilatation
needed to induce AR

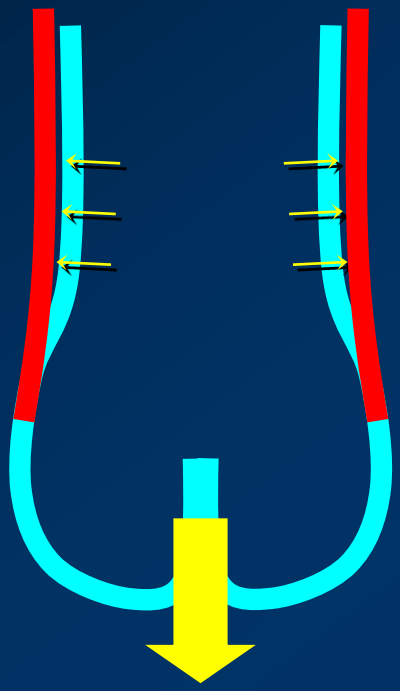




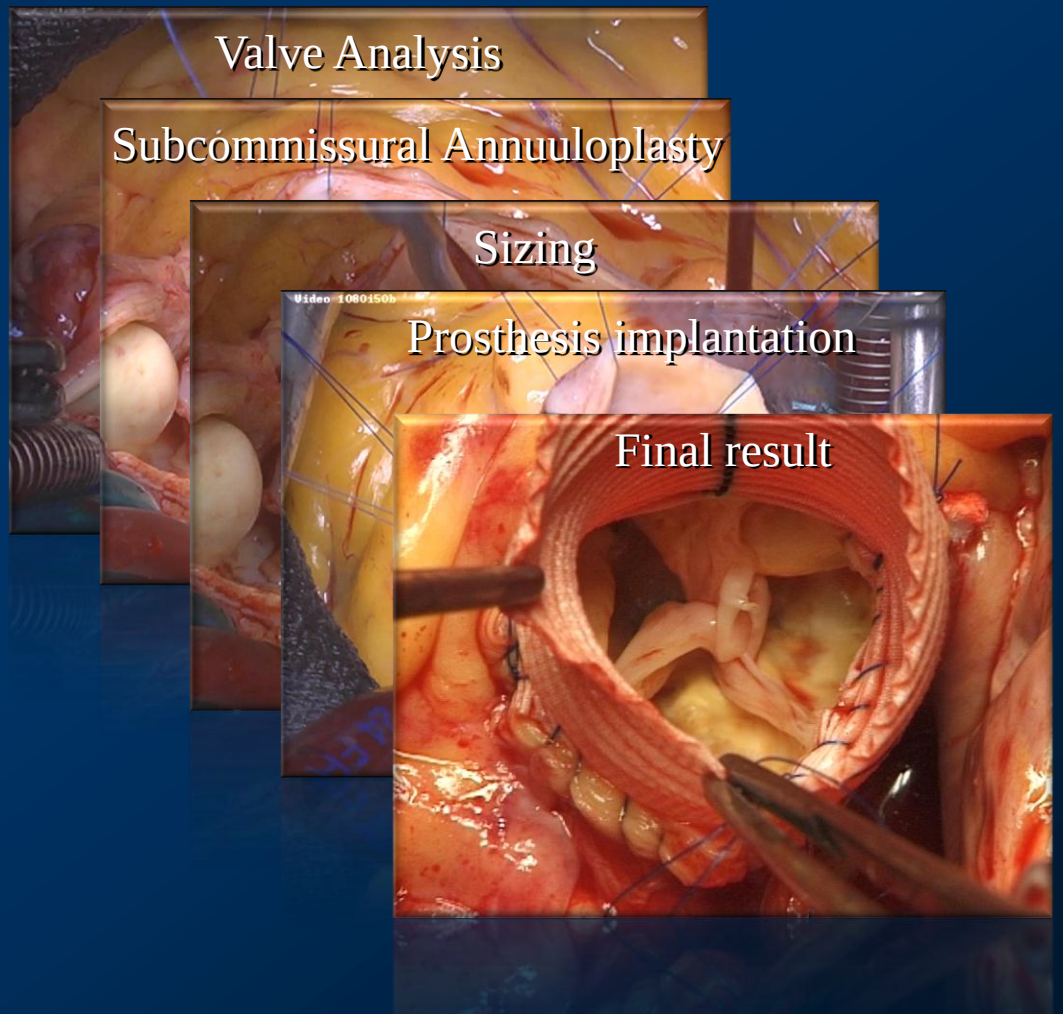
Coaptation should usually be at the level of the free margin, instead of the body of the leaflet withou free margin contact

→ OVERSHORTENING !!!

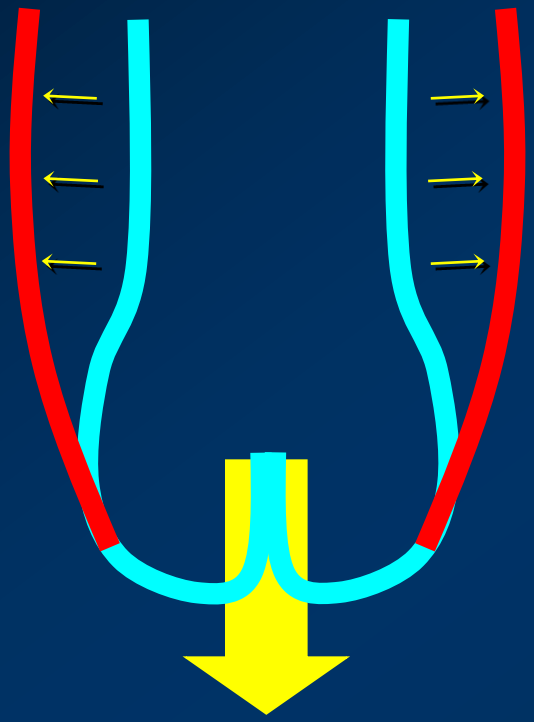
Type Ia repair : Sino-tubular junction remodeling



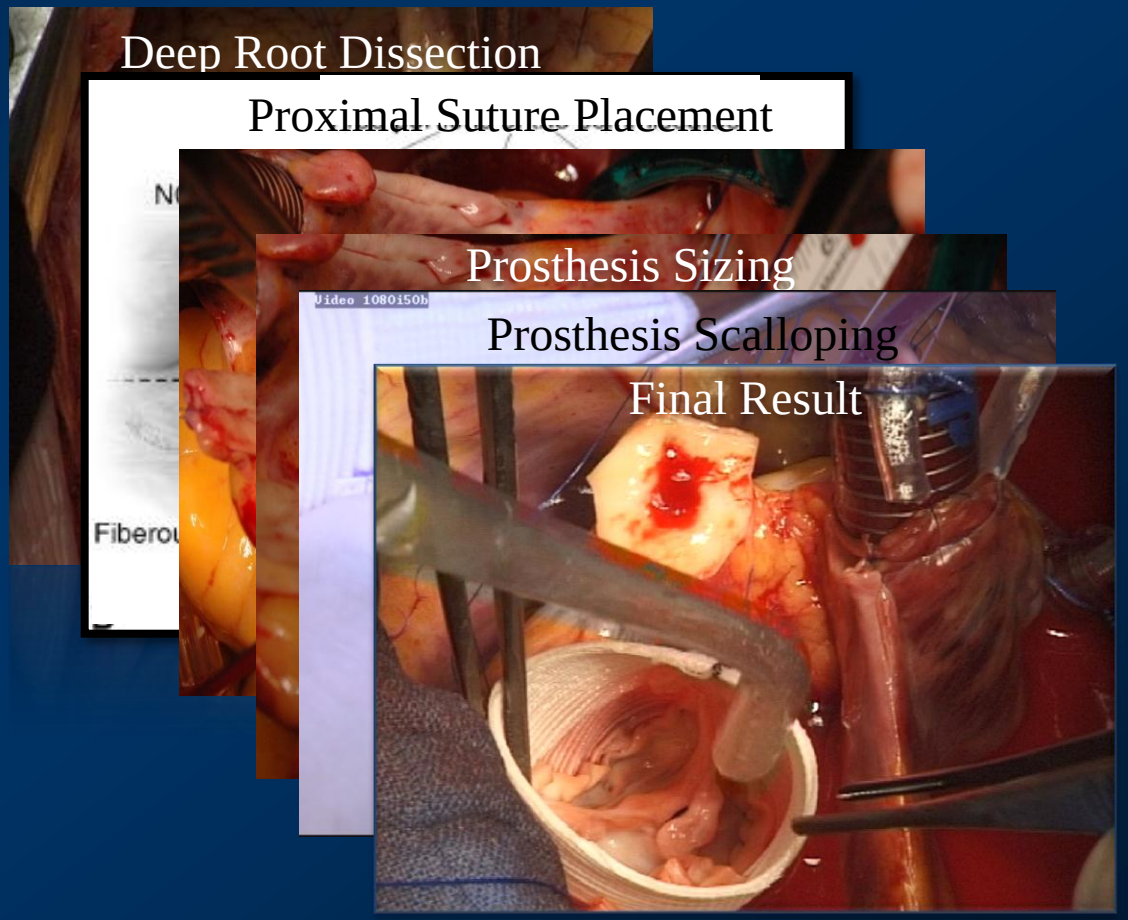
Sino-tubular junction dilatation



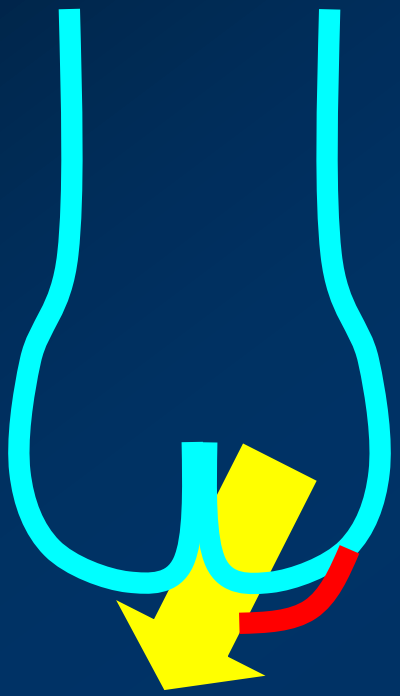
Type Ib repair : Aortic root reimplantation



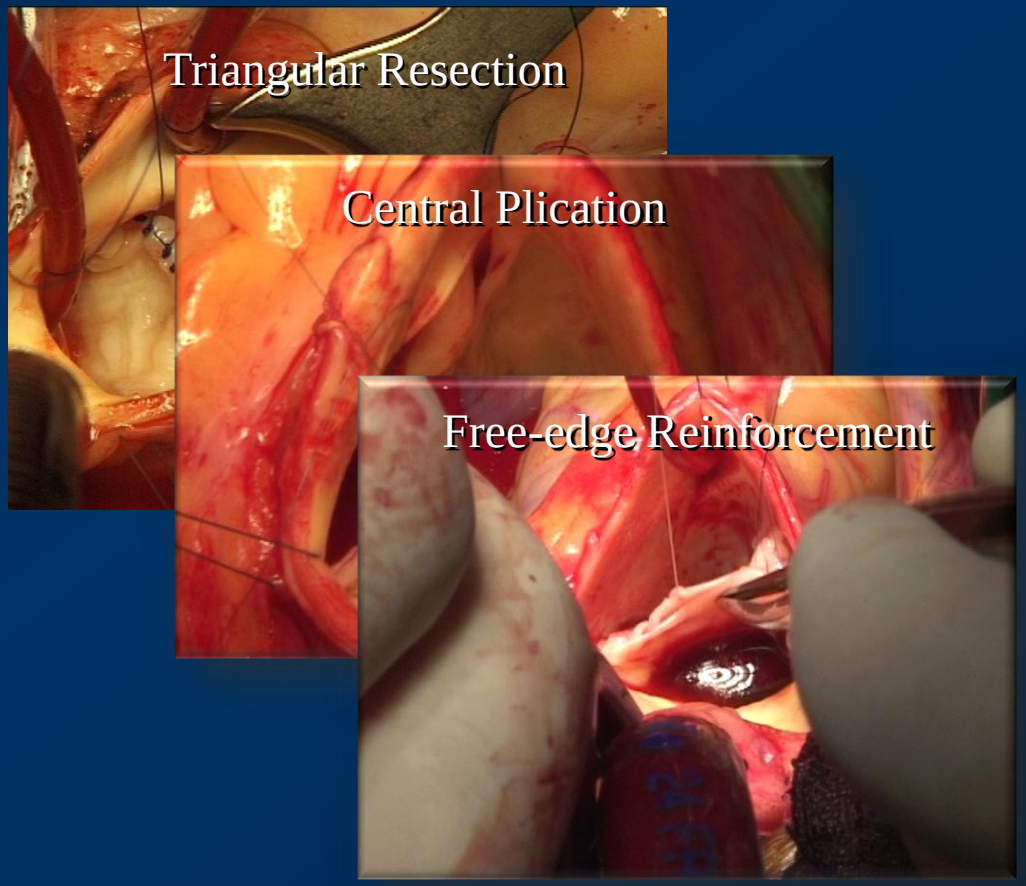
Aortic root aneurysm



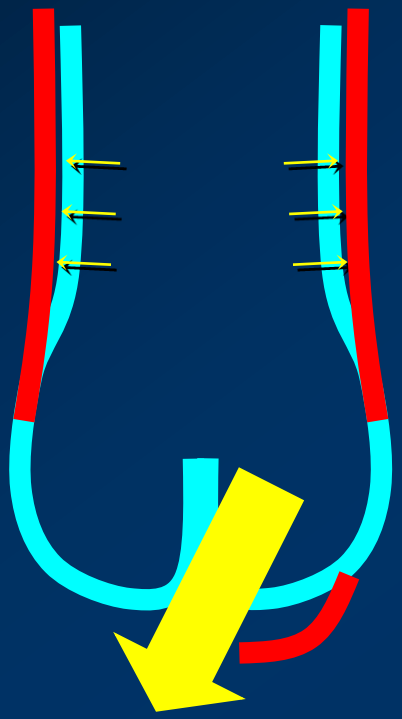
Type II repair

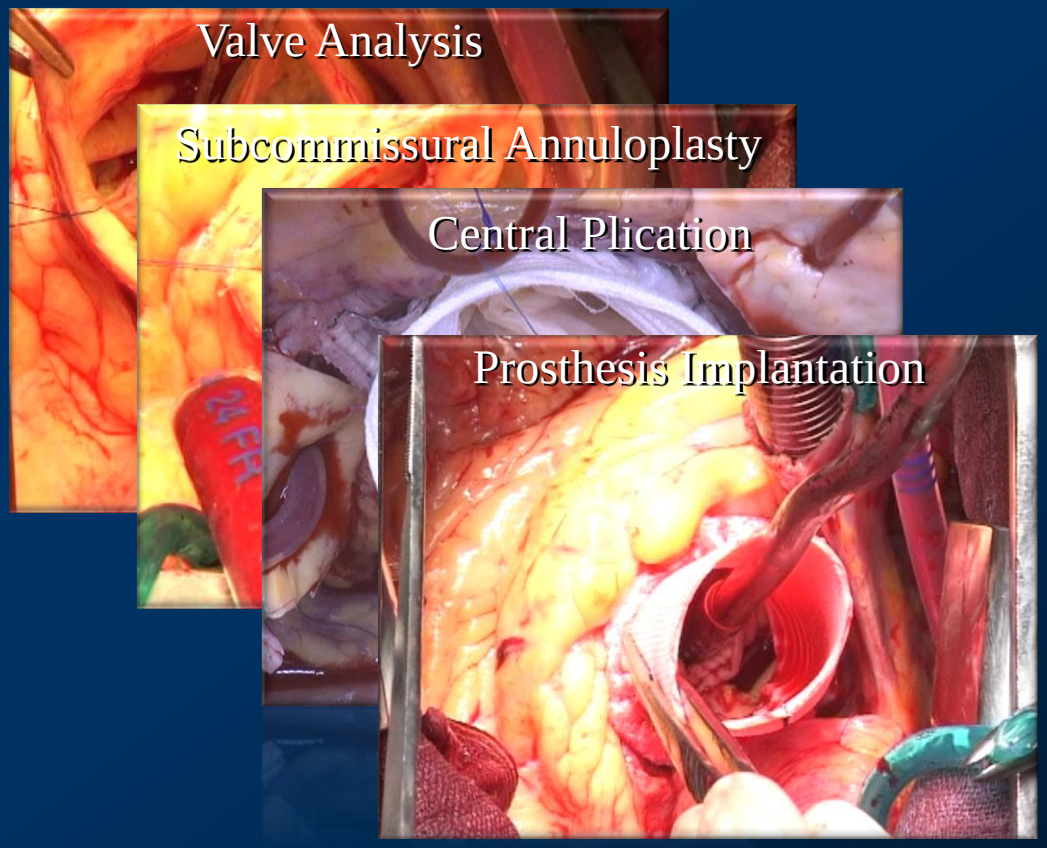


Cuspal prolapse

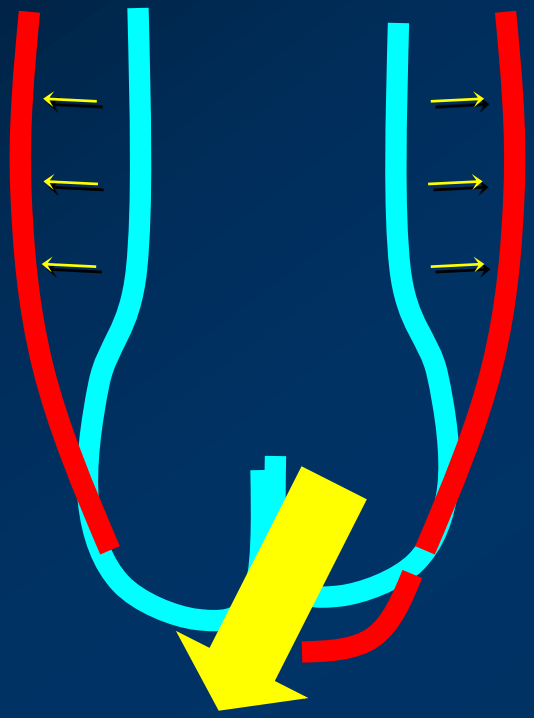


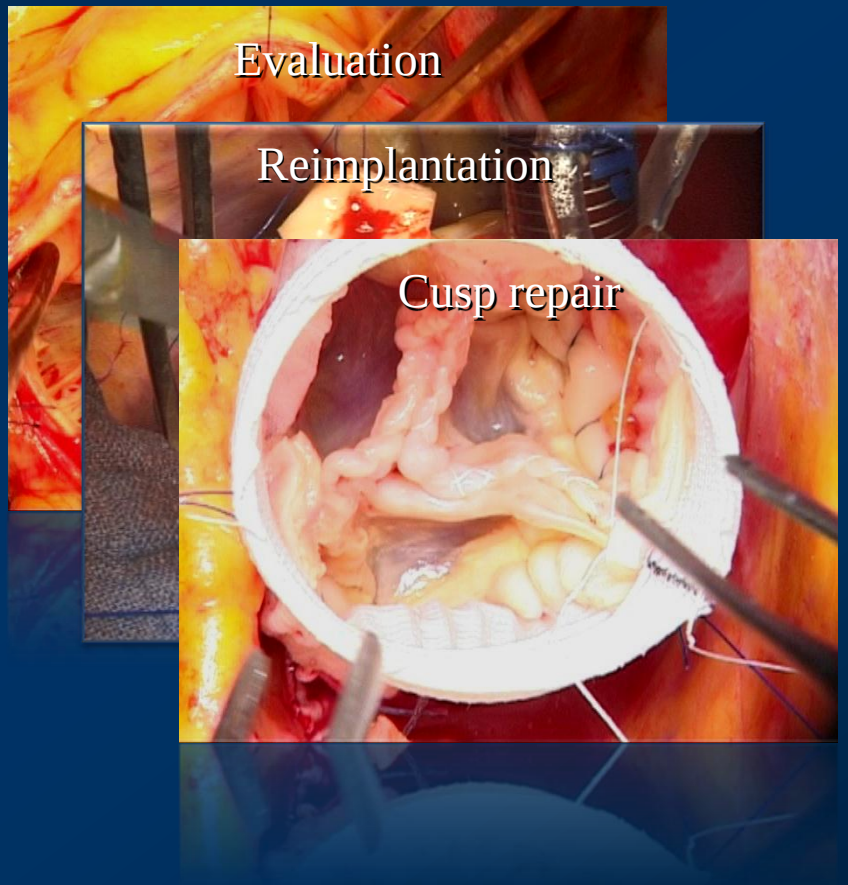
Type Ia + II repair





Type Ib + II repair

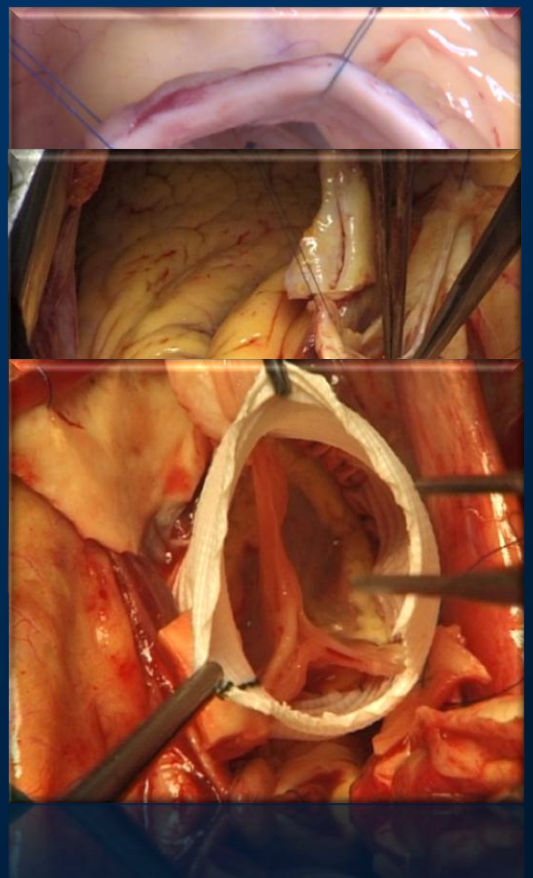




Comonenets of Aortic Valve Repair

The primary goal of aortic valve repair is to restore a functional surface of coaptation

1. Repair or preserve the leaflet tissue
2. Restore and stabilize the proximal and distal borders of the native stent (the FAA)



Operative techniques

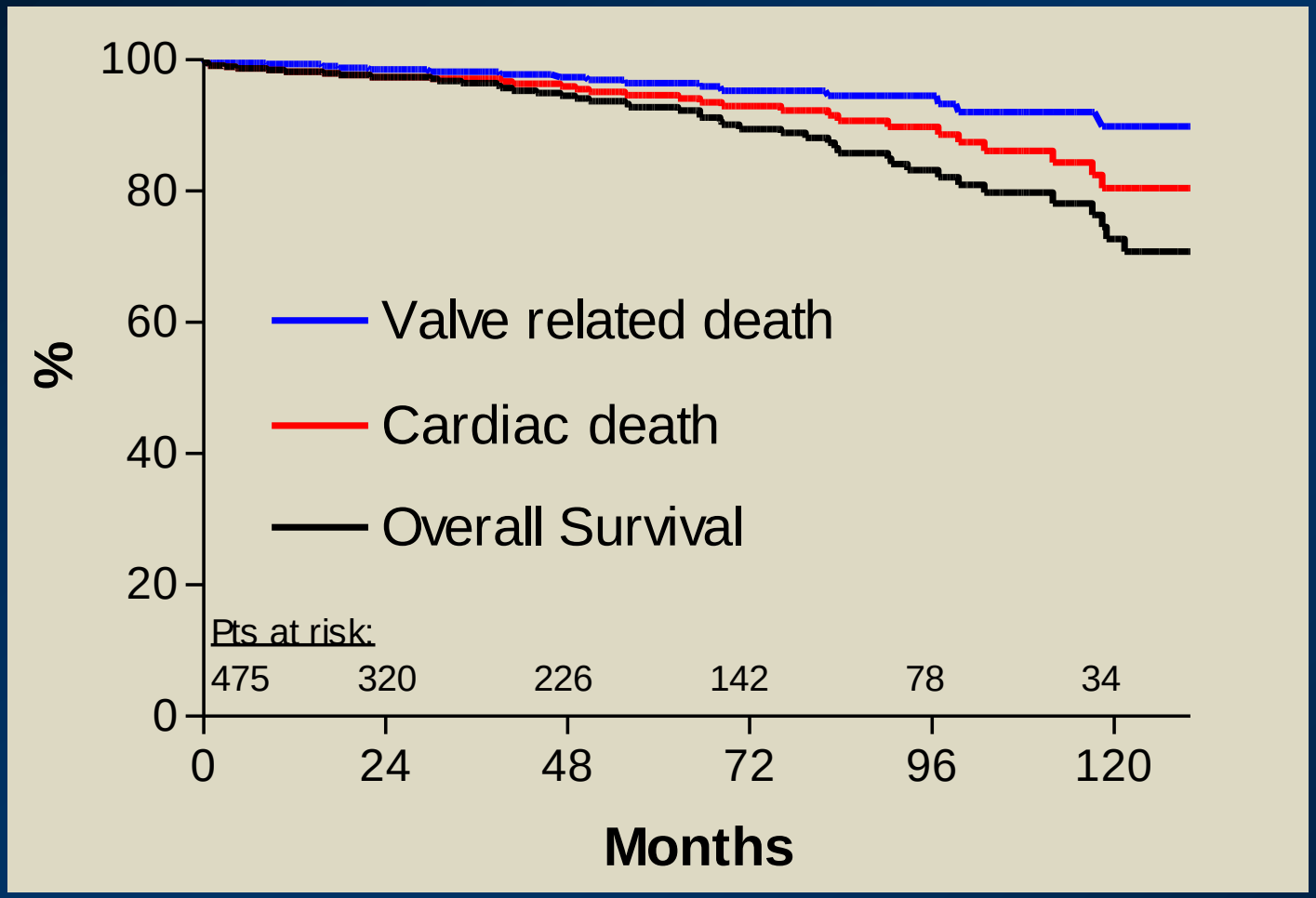
	n=475
Aortic cusp repair	13 (3%)
Subcommissural annuloplasty	22 (5%)
Aortic cusp repair + SCA	124 (26%)
Asc Ao replacement	79 (17%)
+ SCA	68 (86%)
+ Aortic cusp repair	34 (43%)
Valve sparing Root replacement	235 (50%)
Remodeling technique	48 (20%)
Reimplantation technique	187 (80%)
VSRR + Aortic cusp repair	154 (65%)
Intraoperative AV re-exploration	26 (2.2%)
Concomitant procedures	149 (31.3%)
ACC time (min)	95.4 ± 39.9
CPB time (min)	114.2 ± 62.1

MV plasty	65 (44%)
CABG	53 (36%)
TV repair	15 (10%)
Ao Arch replac	13 (8.7%)
MV replac	8 (5%)
PFO closure	8 (5%)
AF ablation	5 (3%)
Dor operation	3 (2%)
LA myxoma	3 (2%)
VSD closure	2 (1%)

Postoperative results

Variable	n=475
Hospital mortality	4 (0.8%)
AV reoperation	7 (1.5%)
Permanent pacemaker insertion	13 (2.7%)
Stroke	5 (1.1%)
TIA	3 (0.6%)

Results: Survival



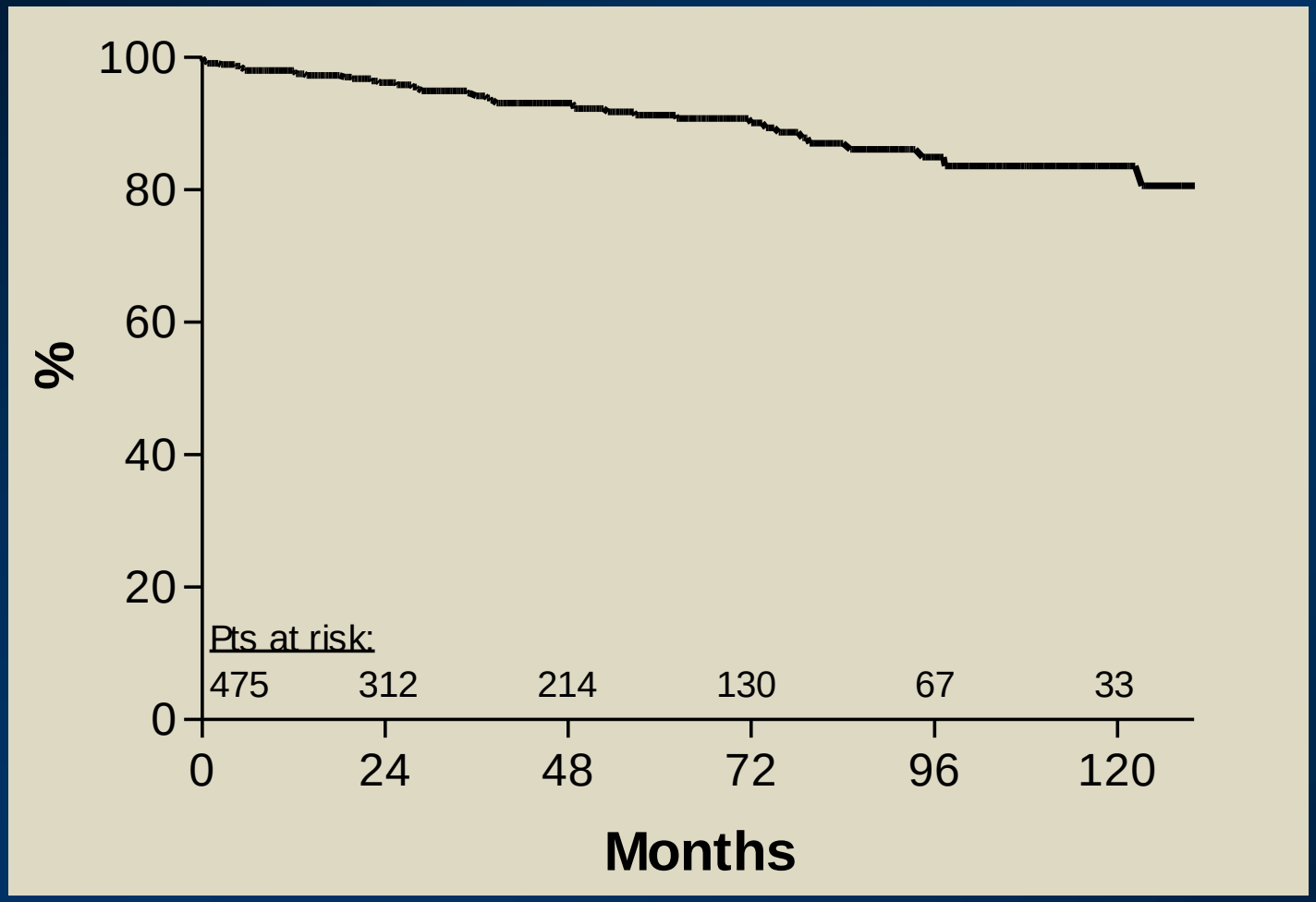
At 10 years:

90%±3%

80%±4%

73%±4%

Results: Structural valve dysfunction

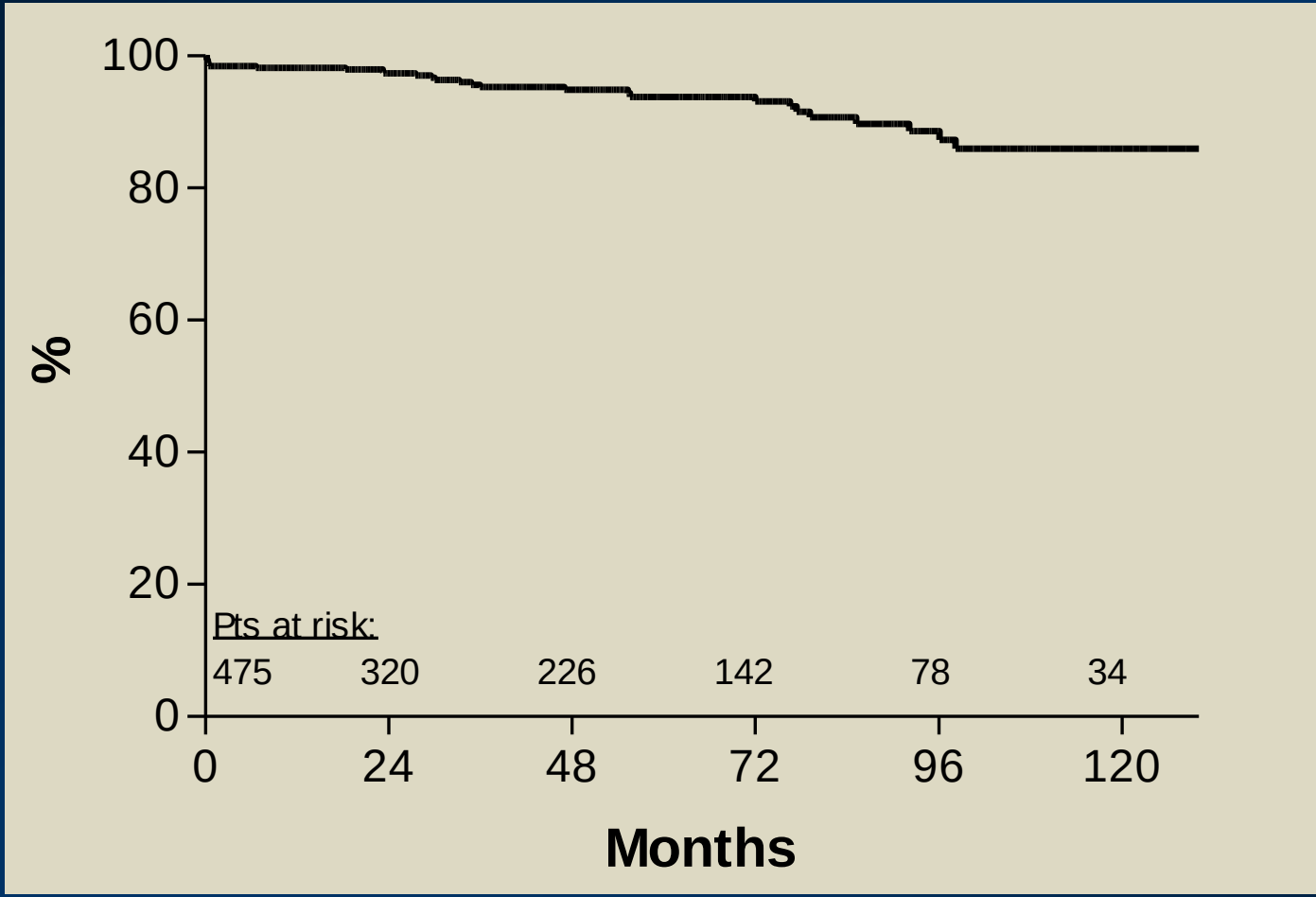


At 10 years:

85%±3%

Results: AV reoperation (n=28)

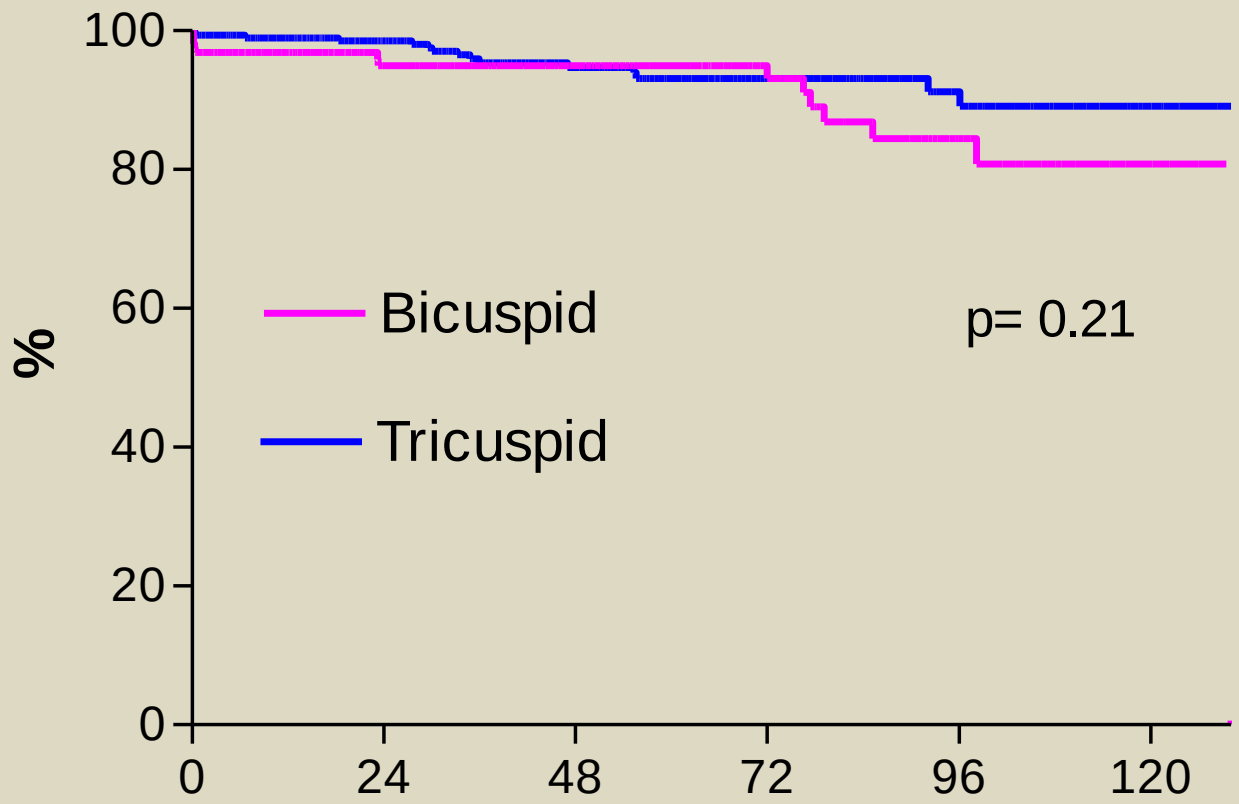
No mortality



At 10 years:

86%±3%

Results: AV reoperation (n=28)



Pts at risk:

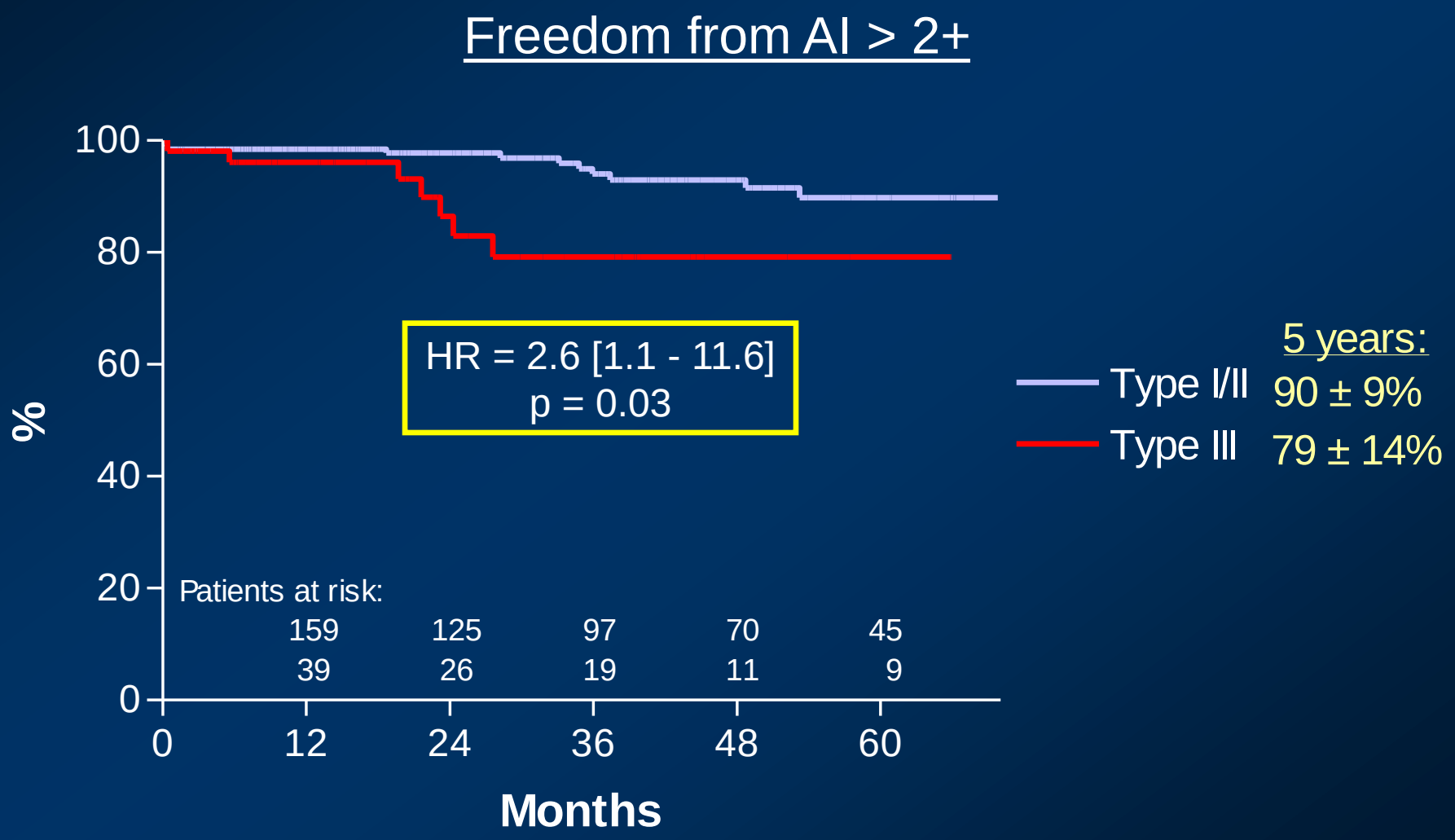
Bicuspid: 163	101	81	51	26	10
Tricuspid: 312	217	140	83	44	24

At 10 years:

81%

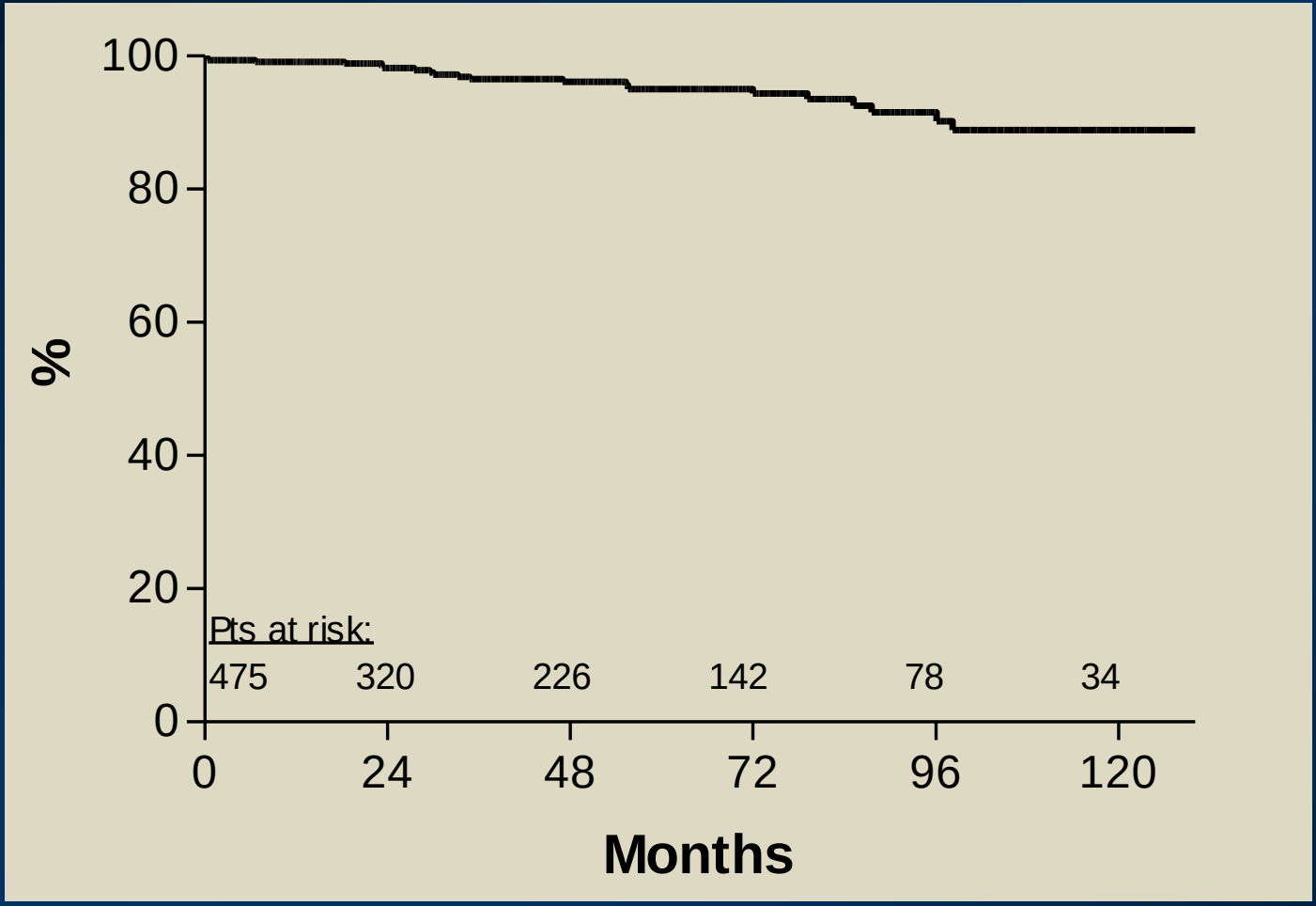
89%

Outcomes in Different AI types



Results: AV replacement

8 AV re-repairs



At 10 years:

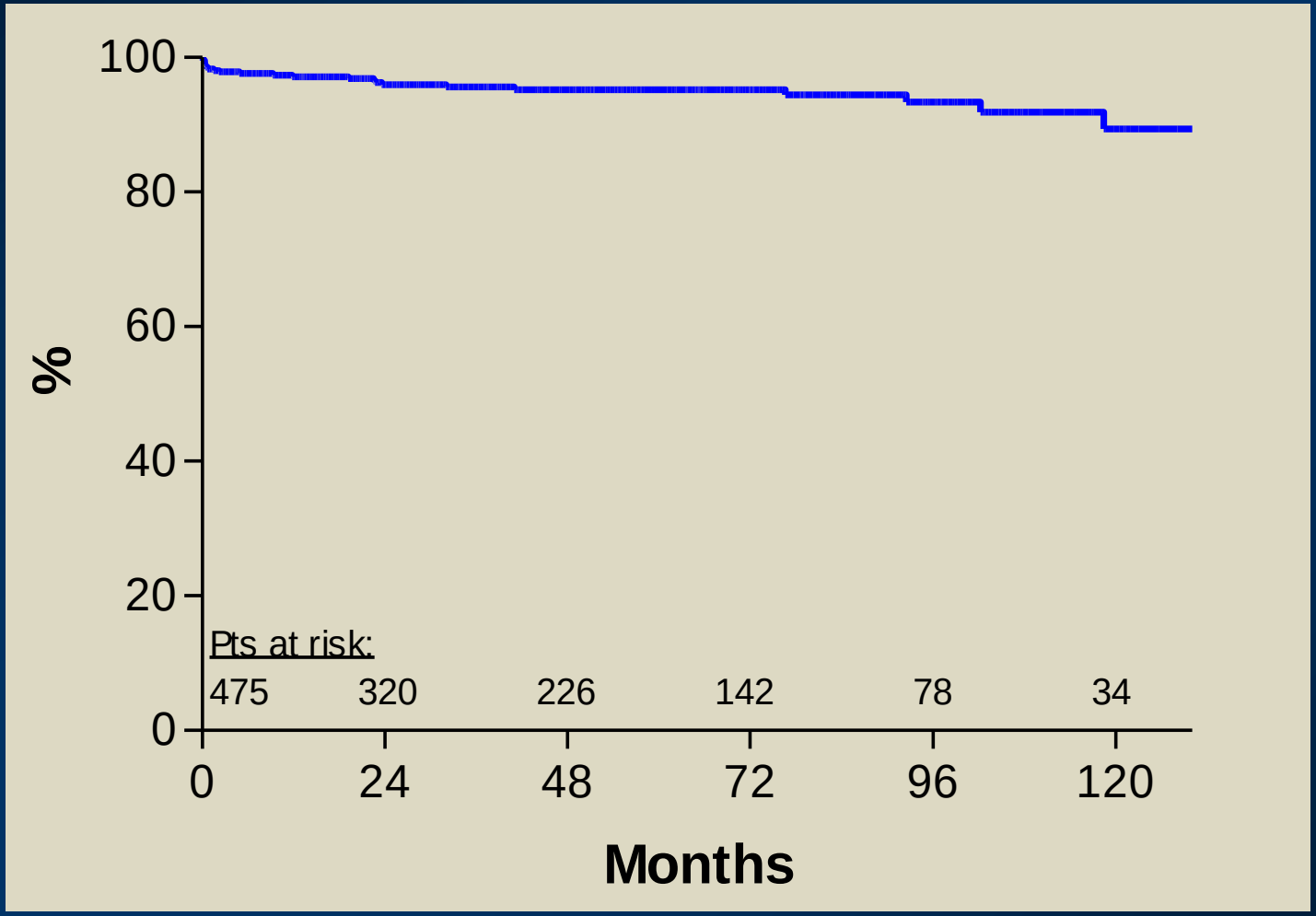
90% ±3%

Results: TE event (n=23)

9 TIA

14 strokes, no death, 11 (78%) full recovery

10 (44%) context of AF



At 10 years:

90%±3%

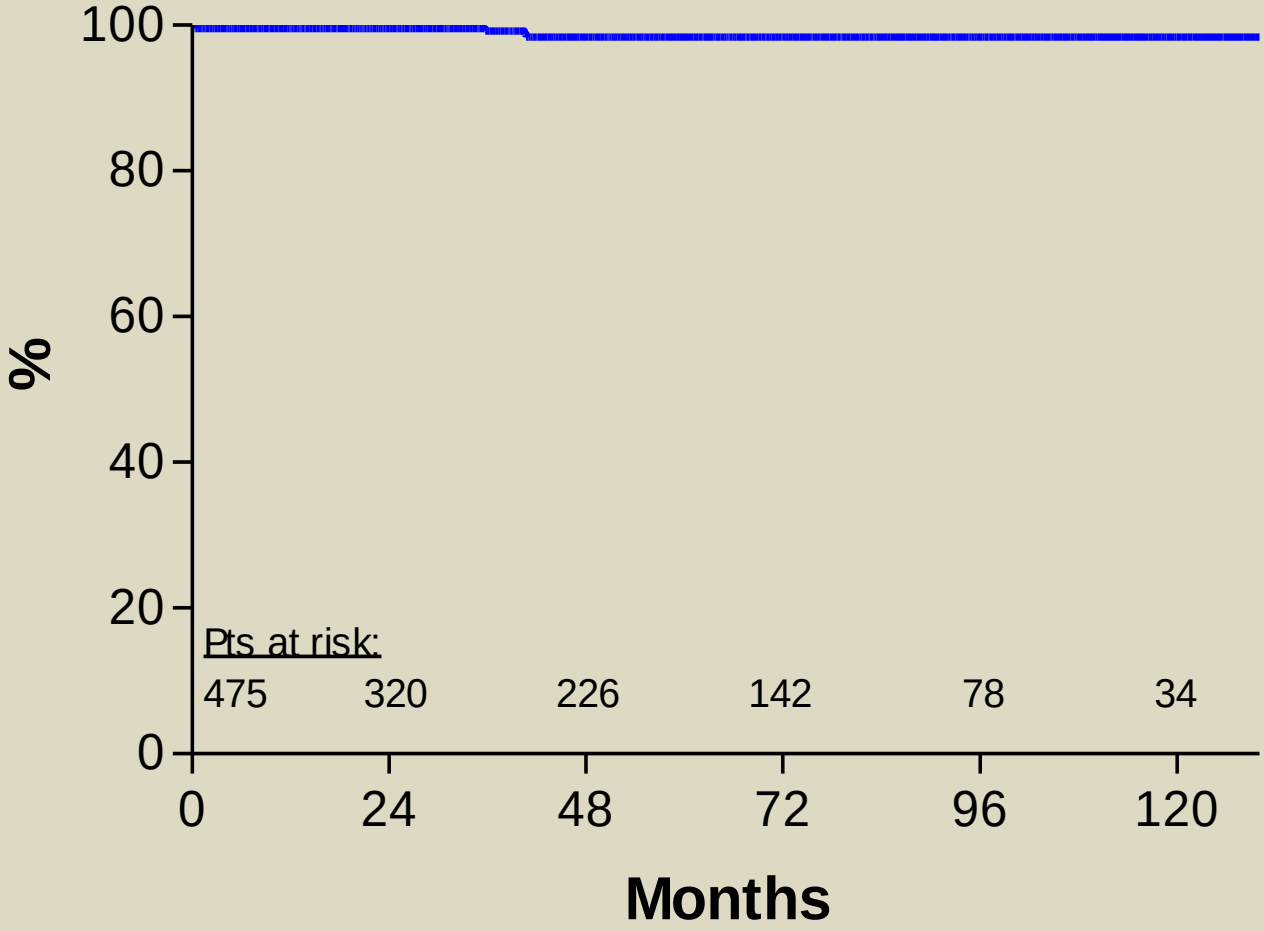
Linearized rate:

1.1% / year

(late TE event 0.7%/year)

Results: Bleeding event (n=5)

3 gastrointestinal
1 cerebral bleeding after AV replacement by mechanical prosthesis
1 abdominal wall



At 10 years:

98%±1%

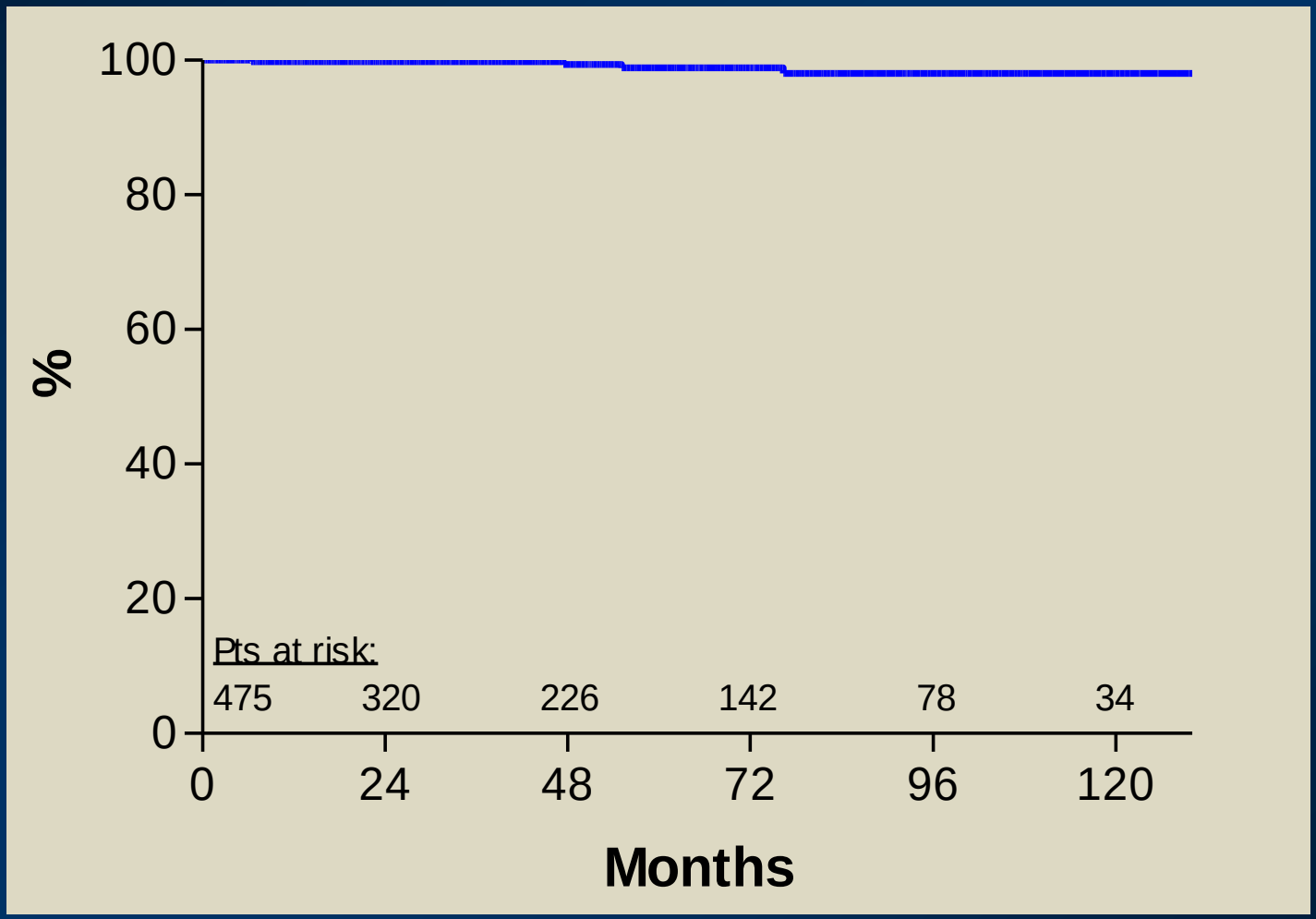
Linearized rate:

0.23 % / year

Results: Endocarditis (n=4)

2 antobiotics only

2 surgery needed (AVR with homograft & re-repair)



At 10 years:

98%±1%

Linearized rate:

0.19 % / year

Results

NYHA:

Class I	80%	(336)
Class II	19%	(78)
Class III	0.5%	(2)
Class IV	0.5%	(2)

Cardiac rhythm:

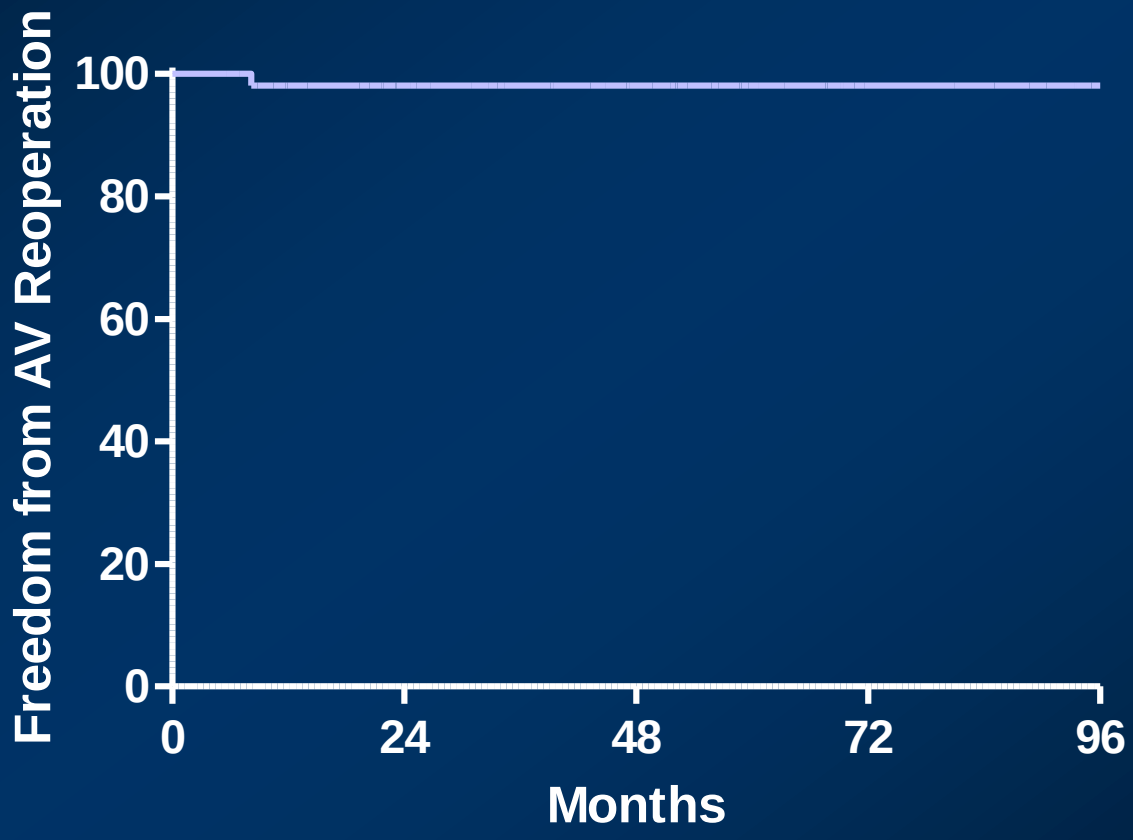
SR	89%	(384)
AF	4.5%	(19)
PM	6.5%	(28)

Antiplatelet – anticoagulation:

• None	26%	(108)
• Aspirin or (Clopidogrel)	65%	(269)
• Coumadin (or LMWH)	8%	(33)
• Aspirin + Coumadin	1%	(5)

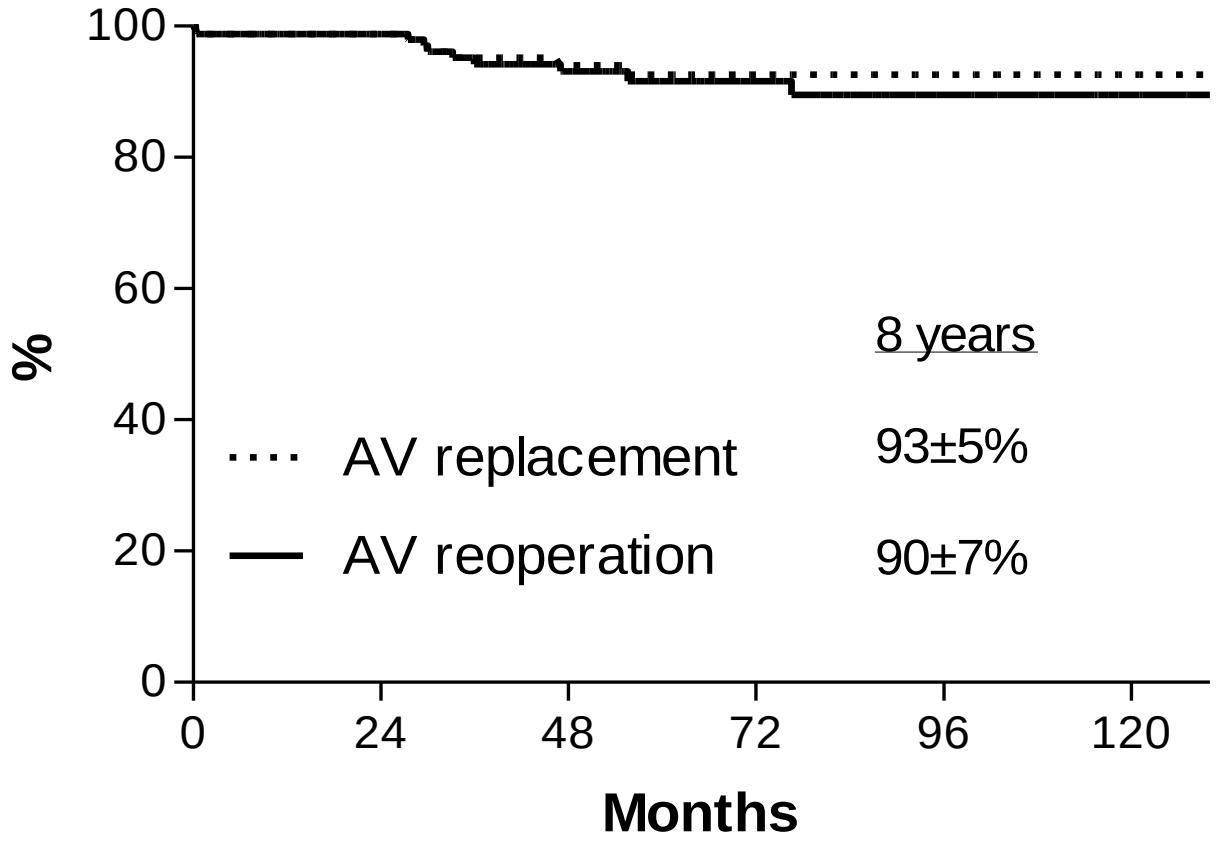
Supracoronary Ascending Aortic Aneurysms (Type 1A)

Freedom from AV Reoperation



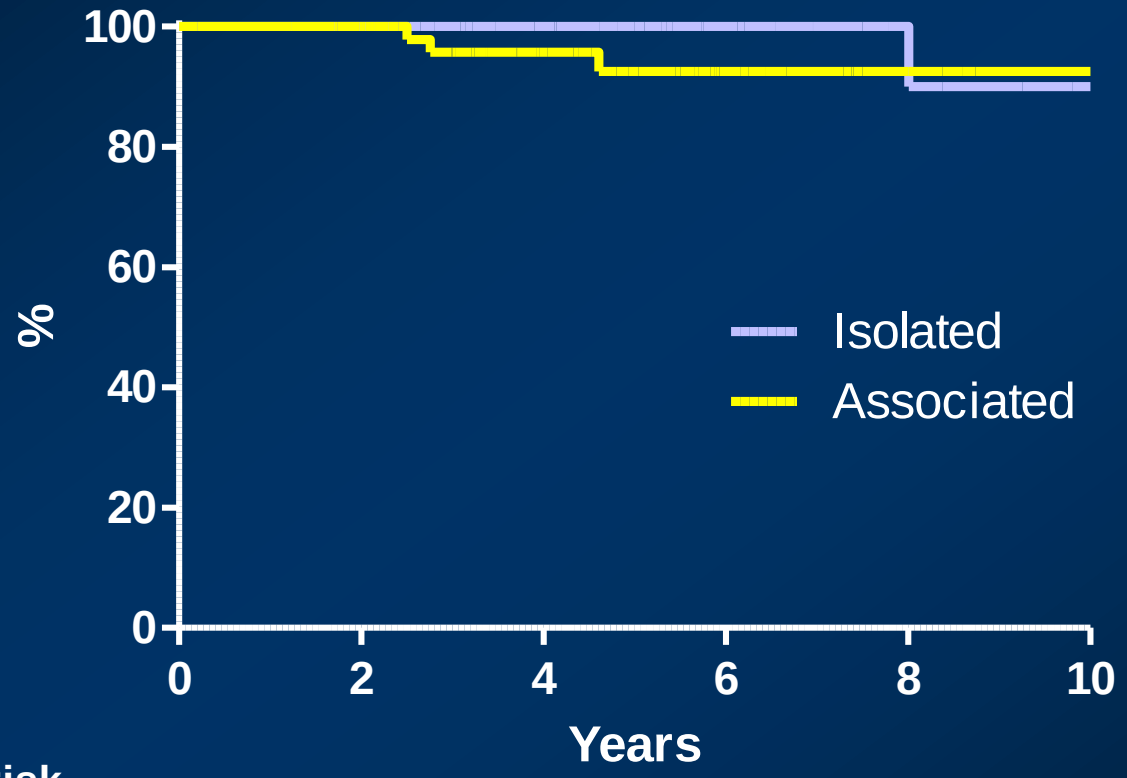
Aneurysm Involving the Aortic Root (Type 1b)

Freedom from AV Reoperation - Replacement



Cusp Prolapse Repair (Type 2)

Freedom from AV Reoperation



8 years

100%

93 ± 4%

No. at risk

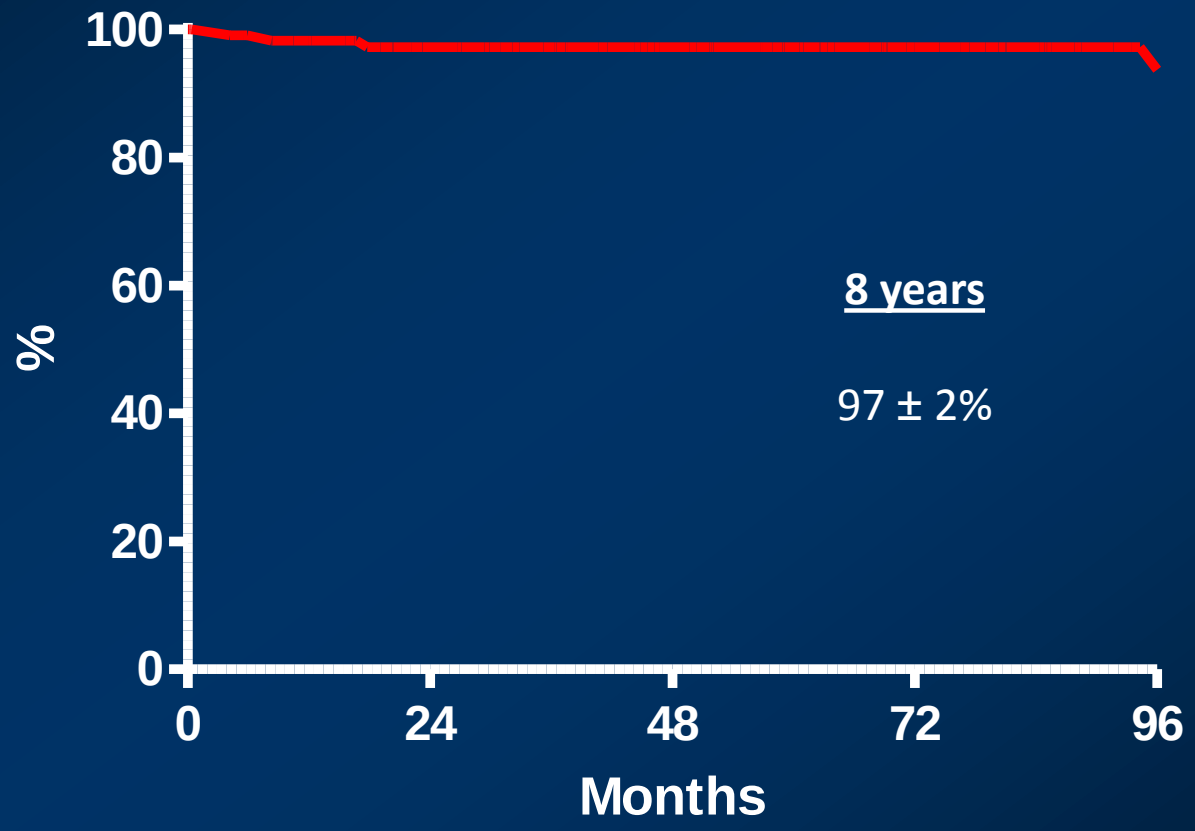
Isolated	50	43	30	18	11	7
Associated	61	56	35	17	7	4

Bicuspid Aortic valve

- Between 1995-2010: 161 elective BAV repairs

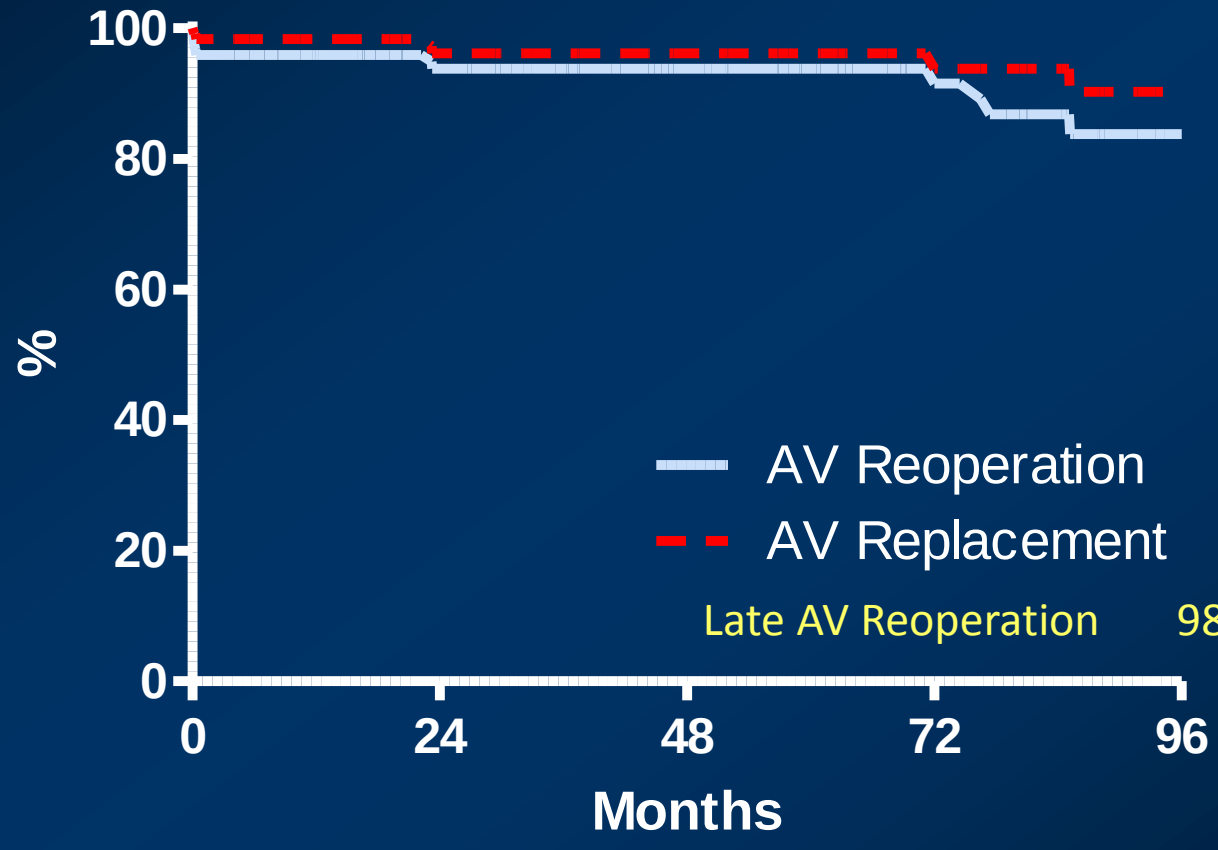
- Type of FAA annuloplasty :
  - No annuloplasty (cusp repair only) n=5
  - SCA n=48
  - Asc ao replacement ± SCA n=17
  - Root Remodeling ± SCA n=17
  - Valve sparing Reimplantation n=74

Overall Survival



No. at risk	119	93	68	41	20

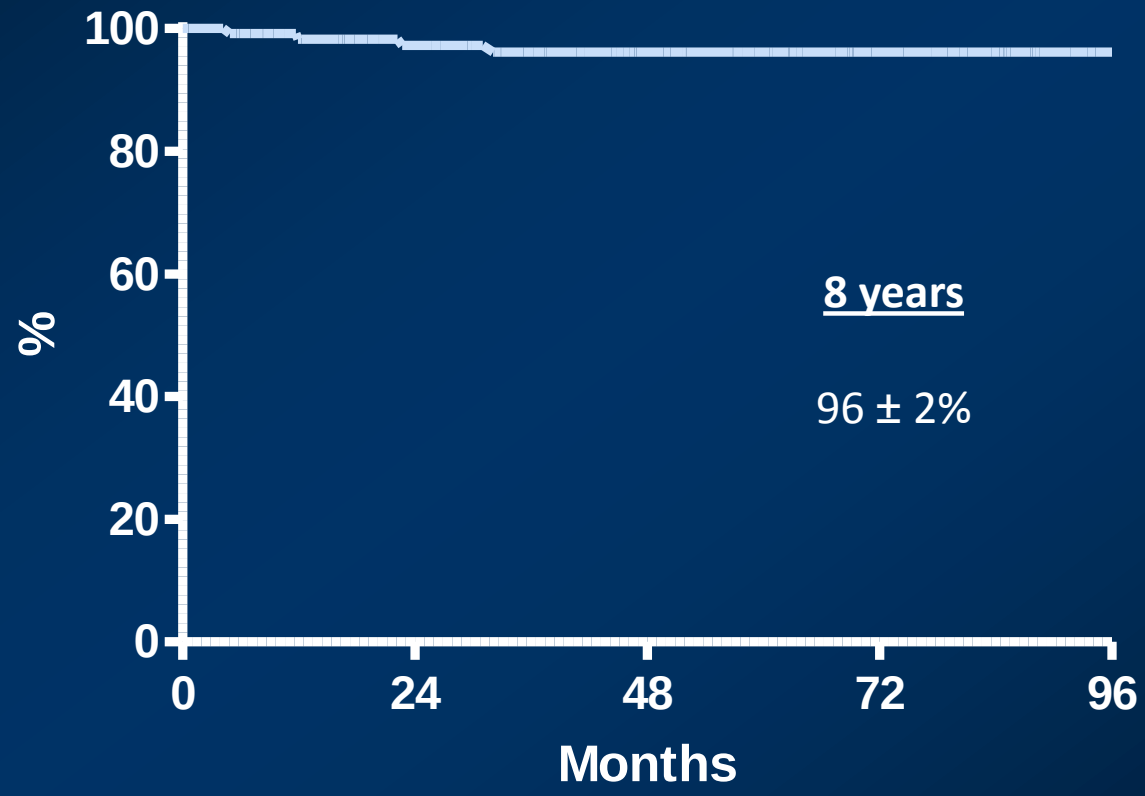
Freedom from Aortic Valve Reoperation



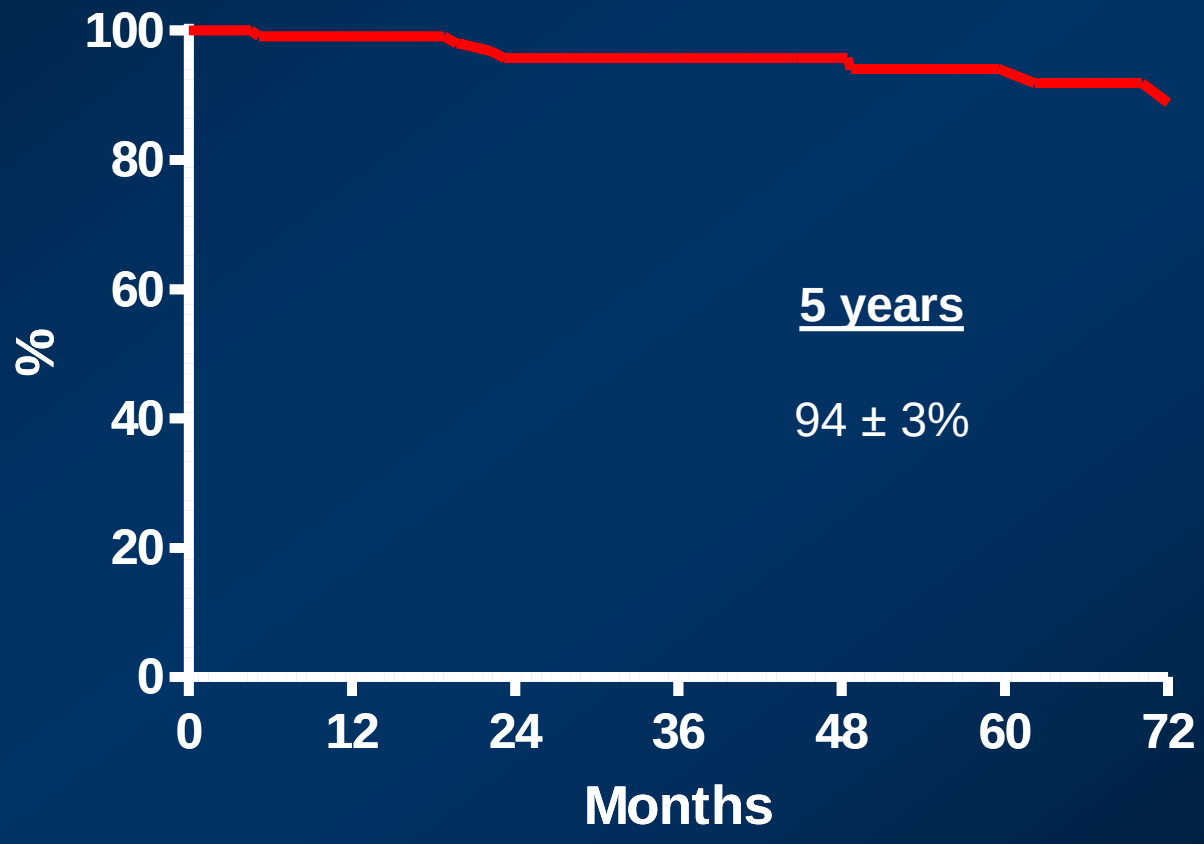
	5 years	8 years
AV Reoperation	94 ± 2%	83 ± 5%
AV Replacement	96 ± 2%	90 ± 5%
Late AV Reoperation	98 ± 2%	87 ± 5%

No. at risk	122	92	68	41	20

Thromboembolism and Bleeding



Freedom from Recurrent Aortic Insufficiency (>2+)



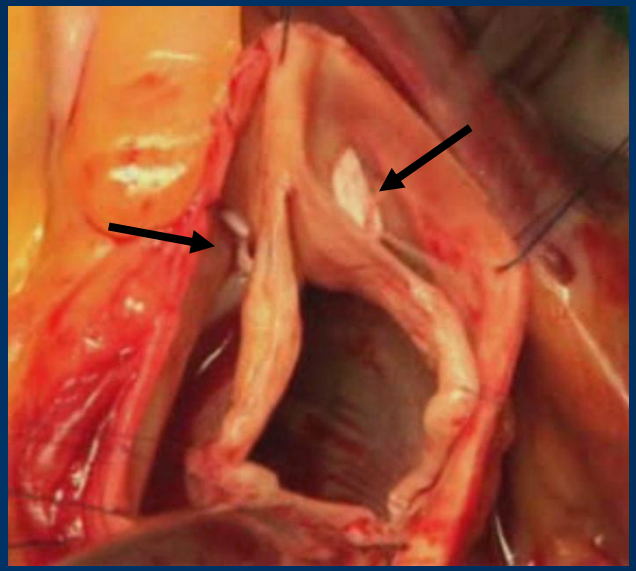
Aim of the study

To assess the role of VAJ in BAV repair

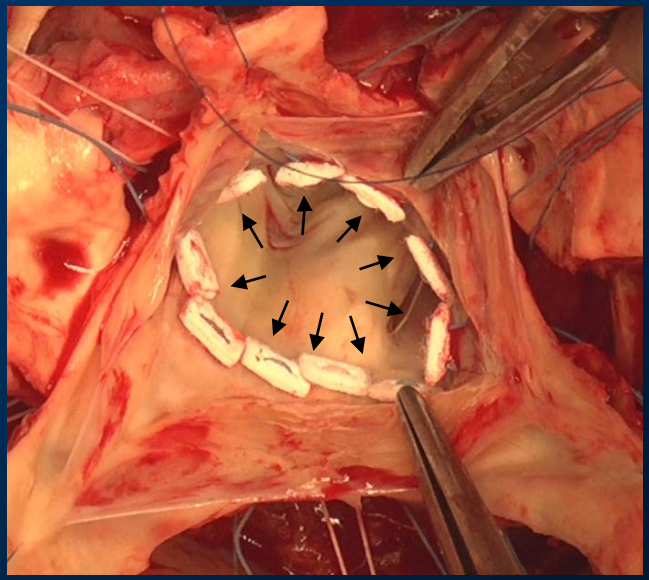
→ Retrospective patient-matched comparison

Group 1	⟷	Group 2
No VAJ annuloplasty, or subcommissural annuloplasty (SCA)		Valve sparing root replacement with the Reimplantation technique

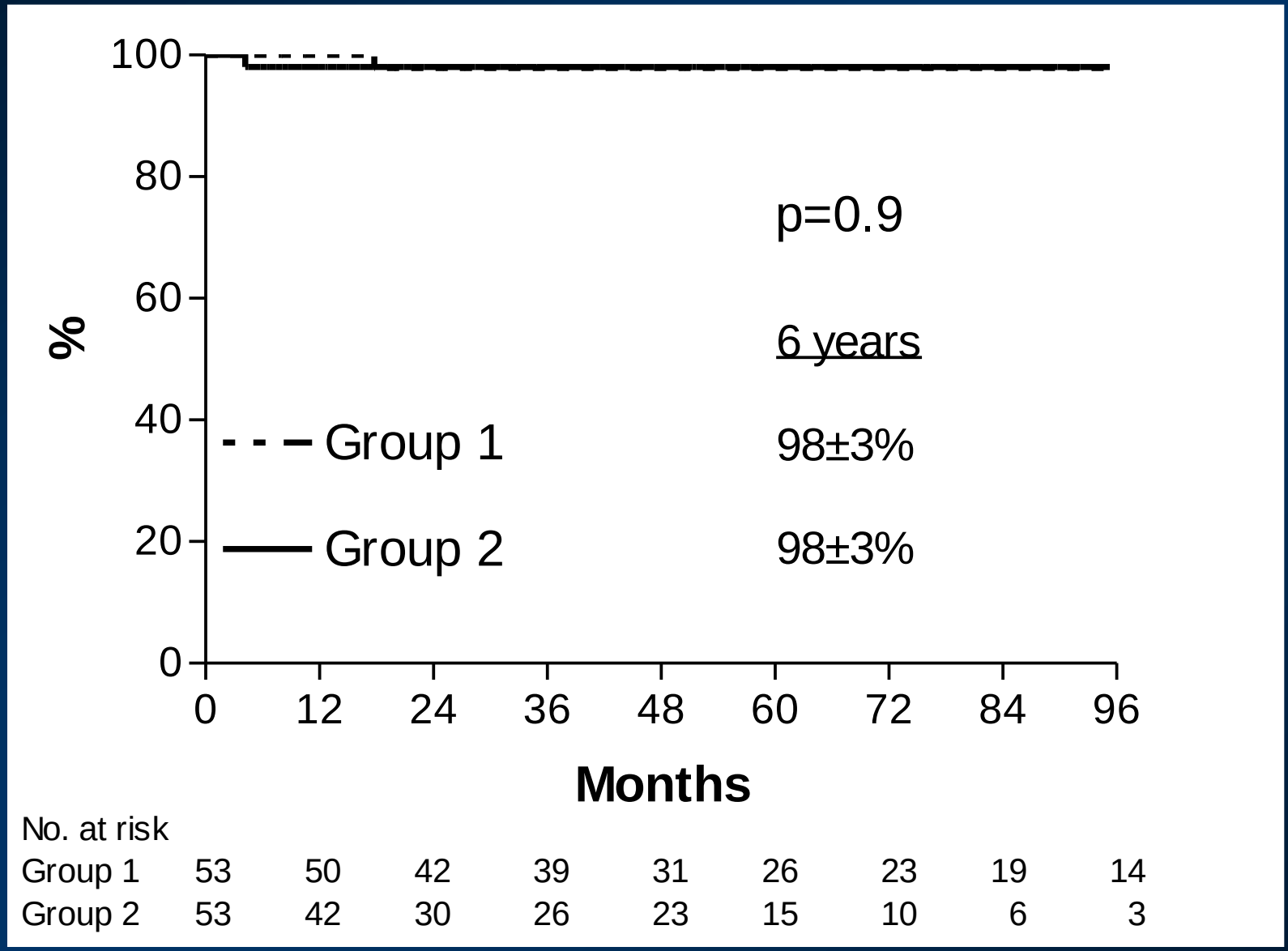
Non-circumferential VAJ annuloplasty



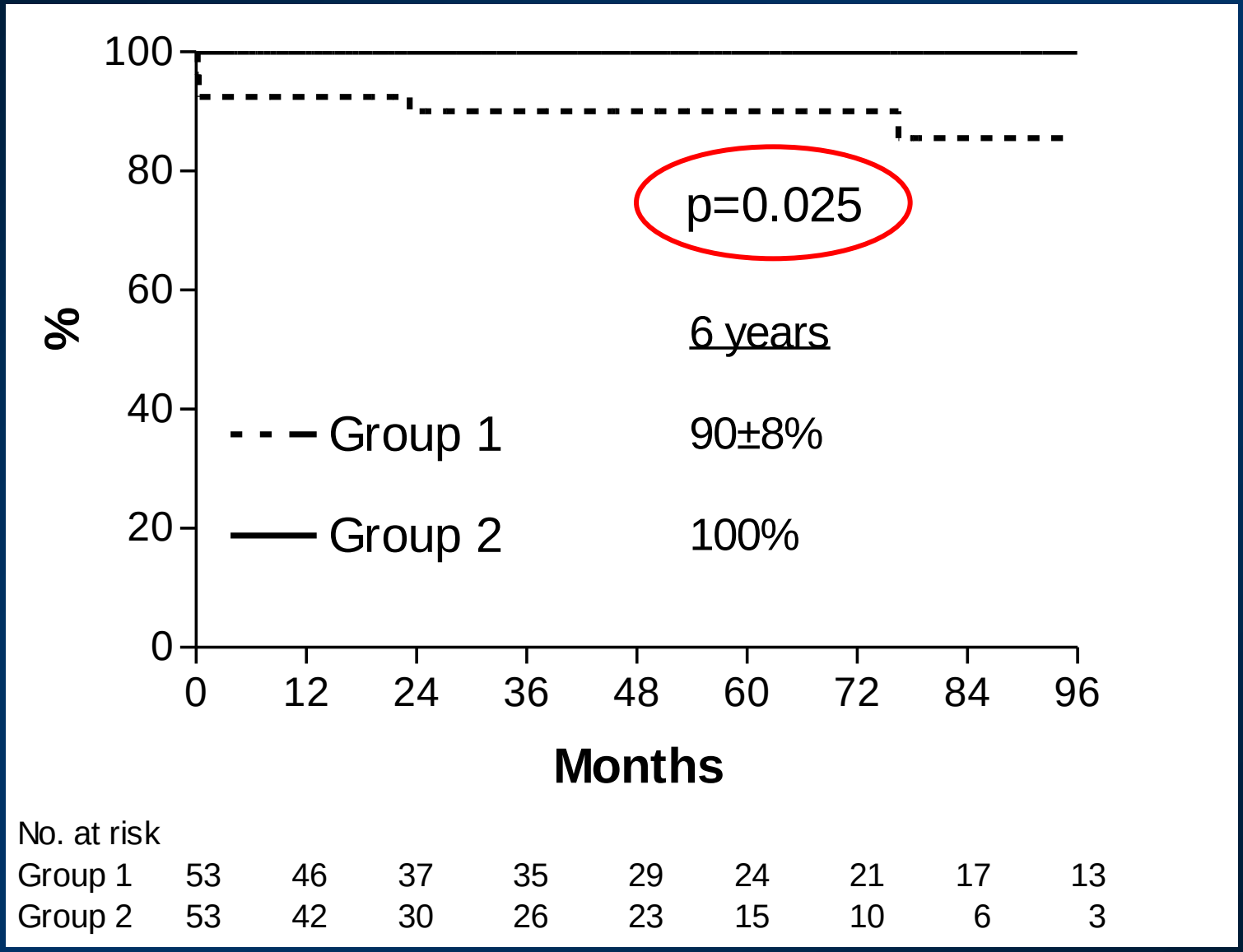
Circumferential VAJ annuloplasty



Overall survival

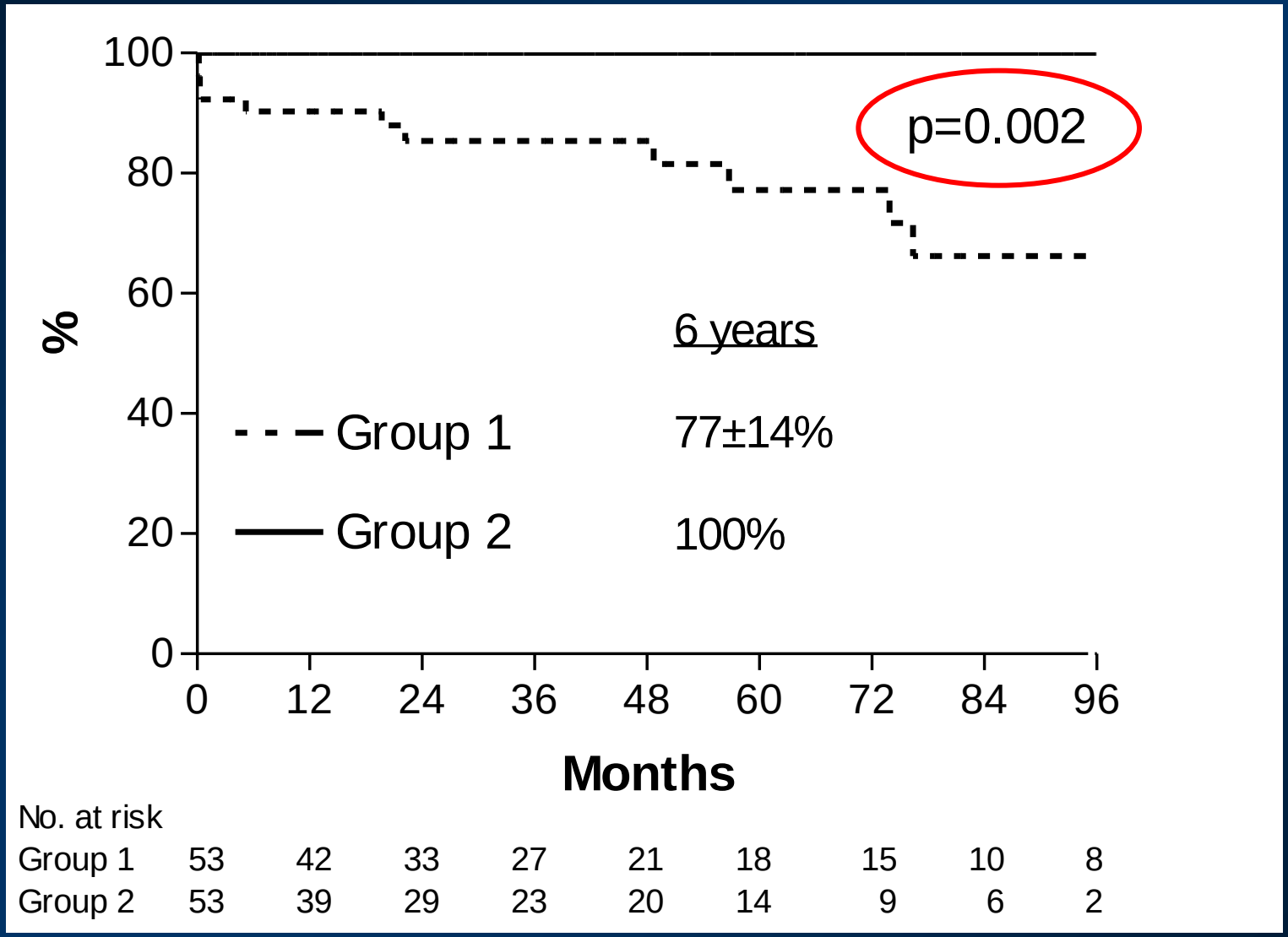


Freedom from BAV reoperation

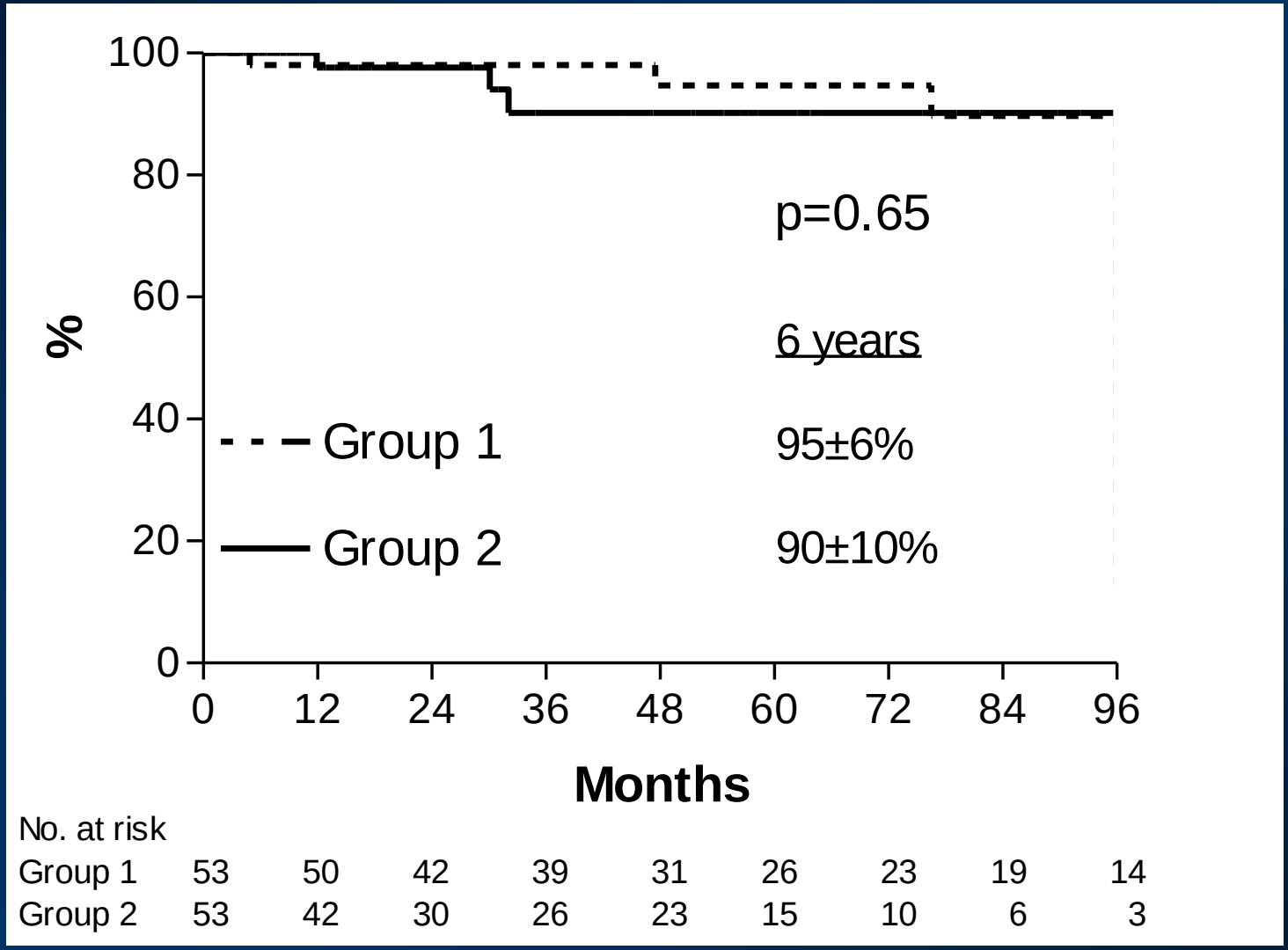


No. at risk									
Group 1	53	46	37	35	29	24	21	17	13
Group 2	53	42	30	26	23	15	10	6	3

Freedom from AI ≥ 3+



Freedom from TE, bleeding or endocarditis



Conclusions

- Aortic valve repair is associated with low mortality, acceptable durability, and a low risk of valve-related complications.
- In this relatively young cohort of patient, AV repair seems to have low rate of TE and bleeding in comparison to mechanical valve.
- These data can aid in the decision making of repair versus replacement in patients eligible for AV repair. However, follow-up beyond 10 y is necessary to compare long term durability with tissues valve.

Thank you