

VI CONGRESSO NAZIONALE DI ECOCARDIOCHIRURGIA

Milano, 15-17 Ottobre 2012

La dilatazione dell'aorta ascendente in portatore di protesi valvolare aortica normofunzionante: criteri di indicazione chirurgica e tecniche

Prof. U. Livi, MD, FECTS



**AZIENDA
OSPEDALIERO
UNIVERSITARIA**



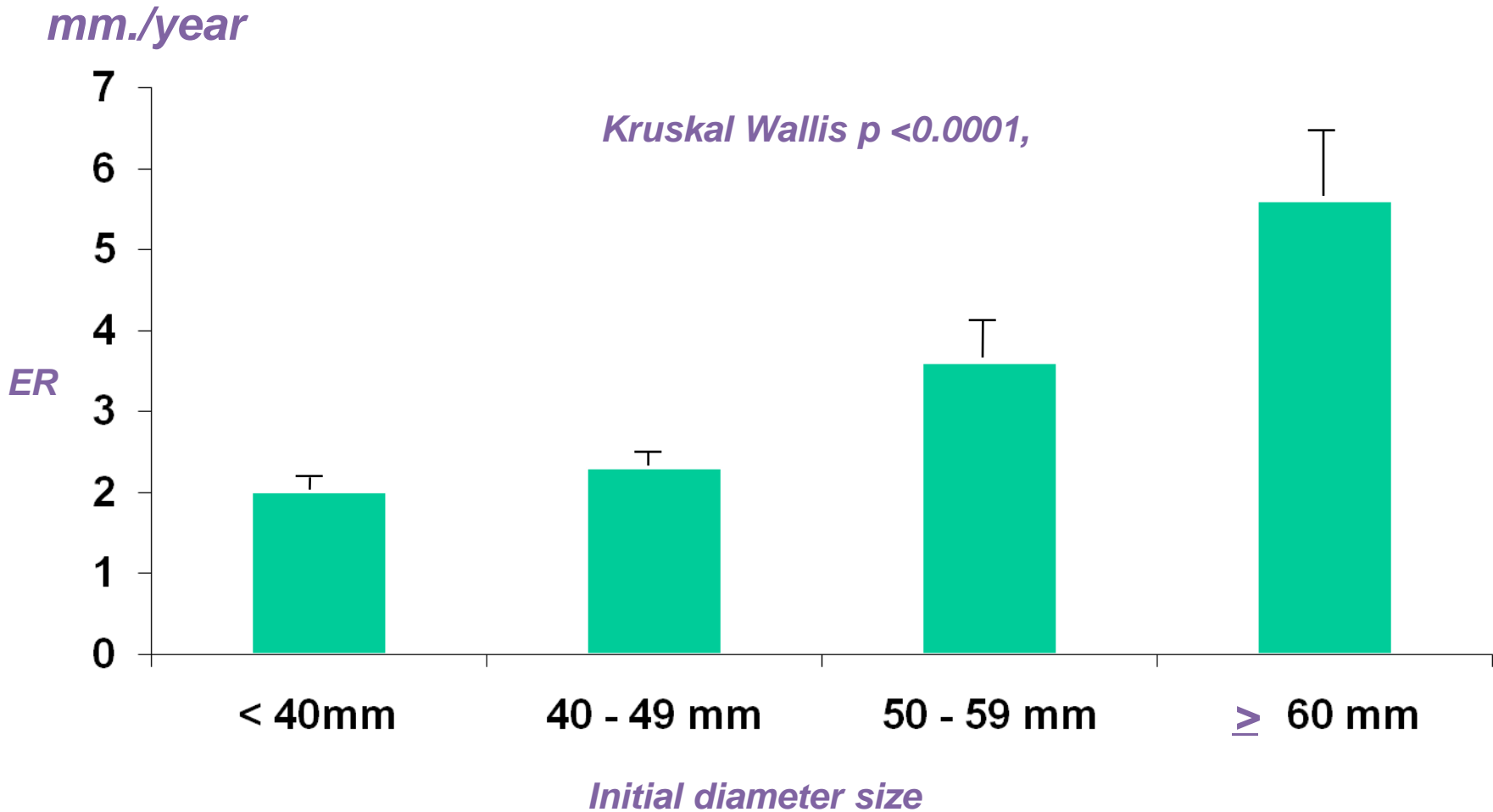
**Santa Maria
della Misericordia
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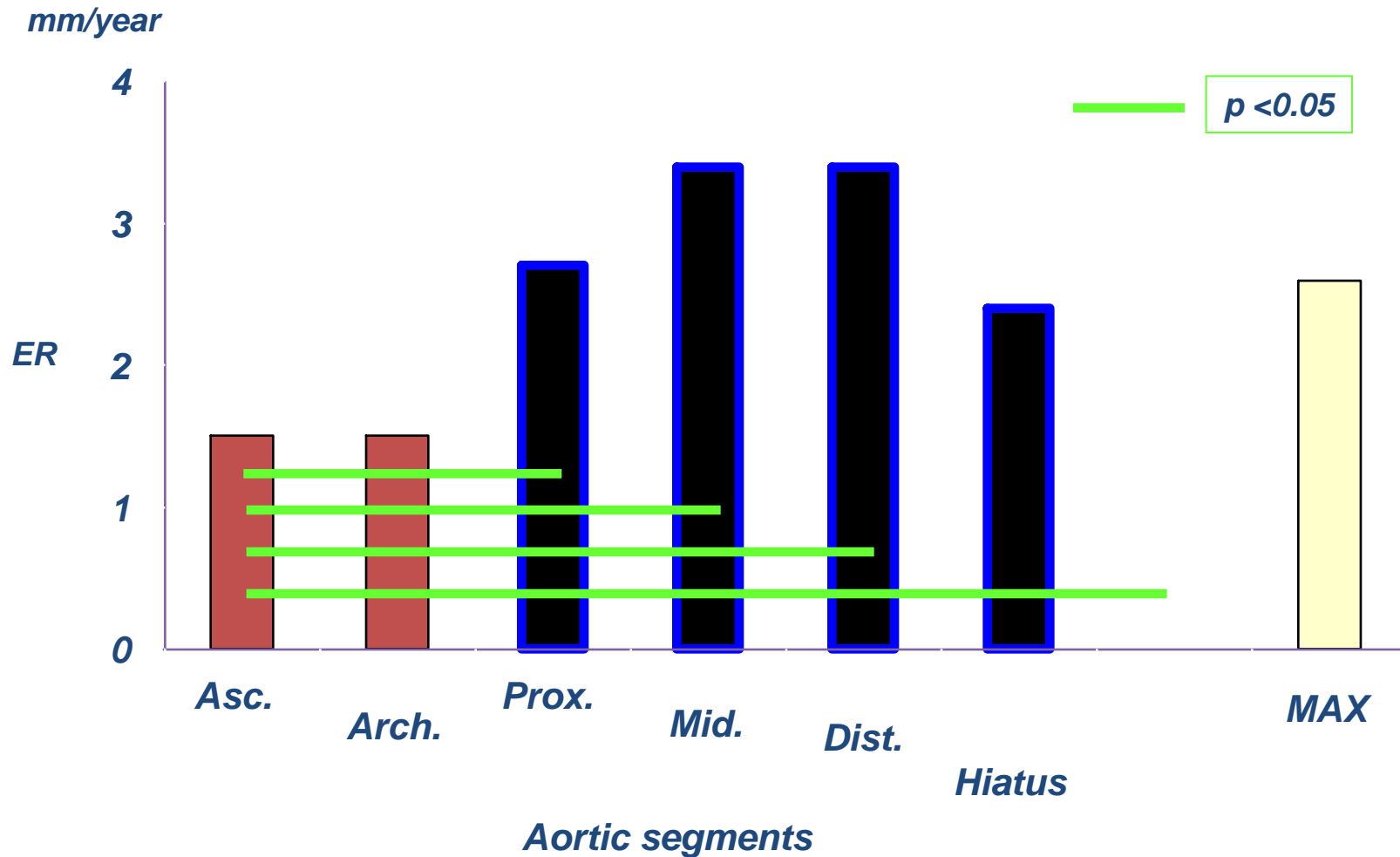
**Cardiothoracic Department
“S.Maria della Misericordia” University Hospital,
Udine**



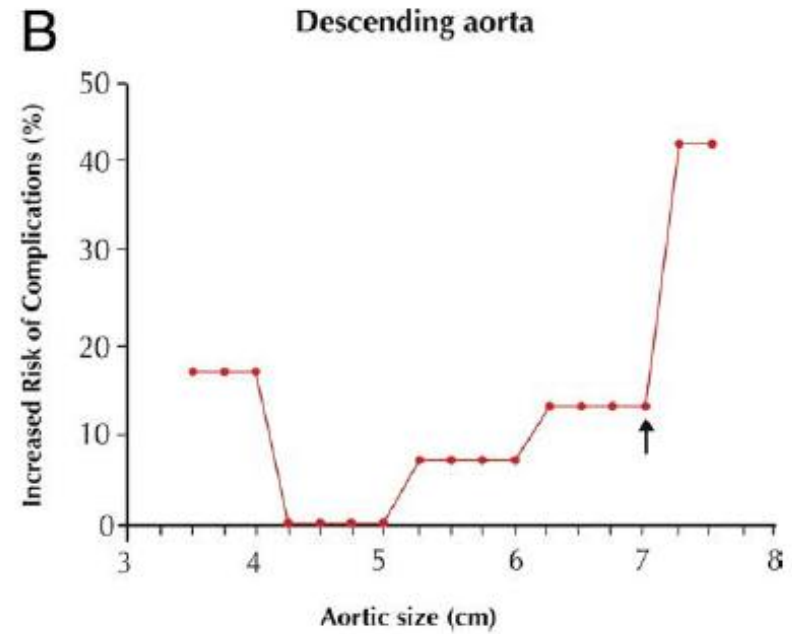
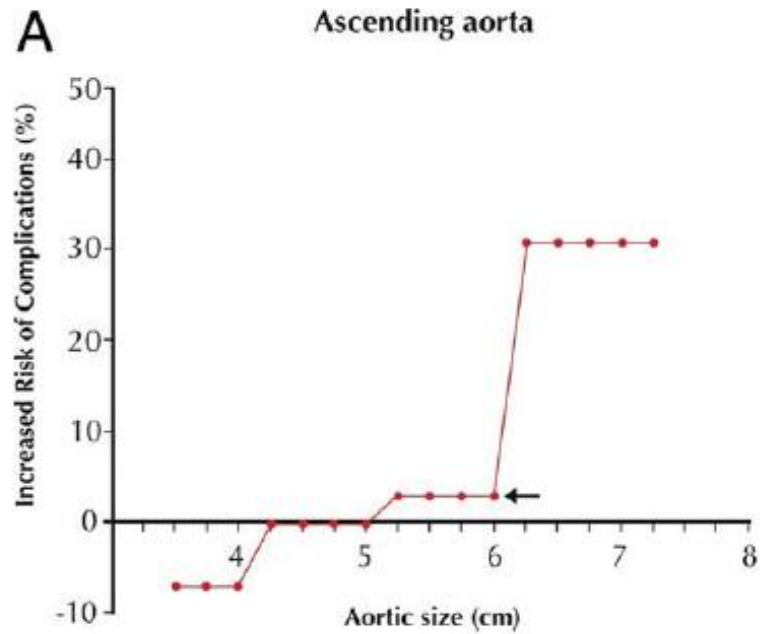
Expansion rate by size



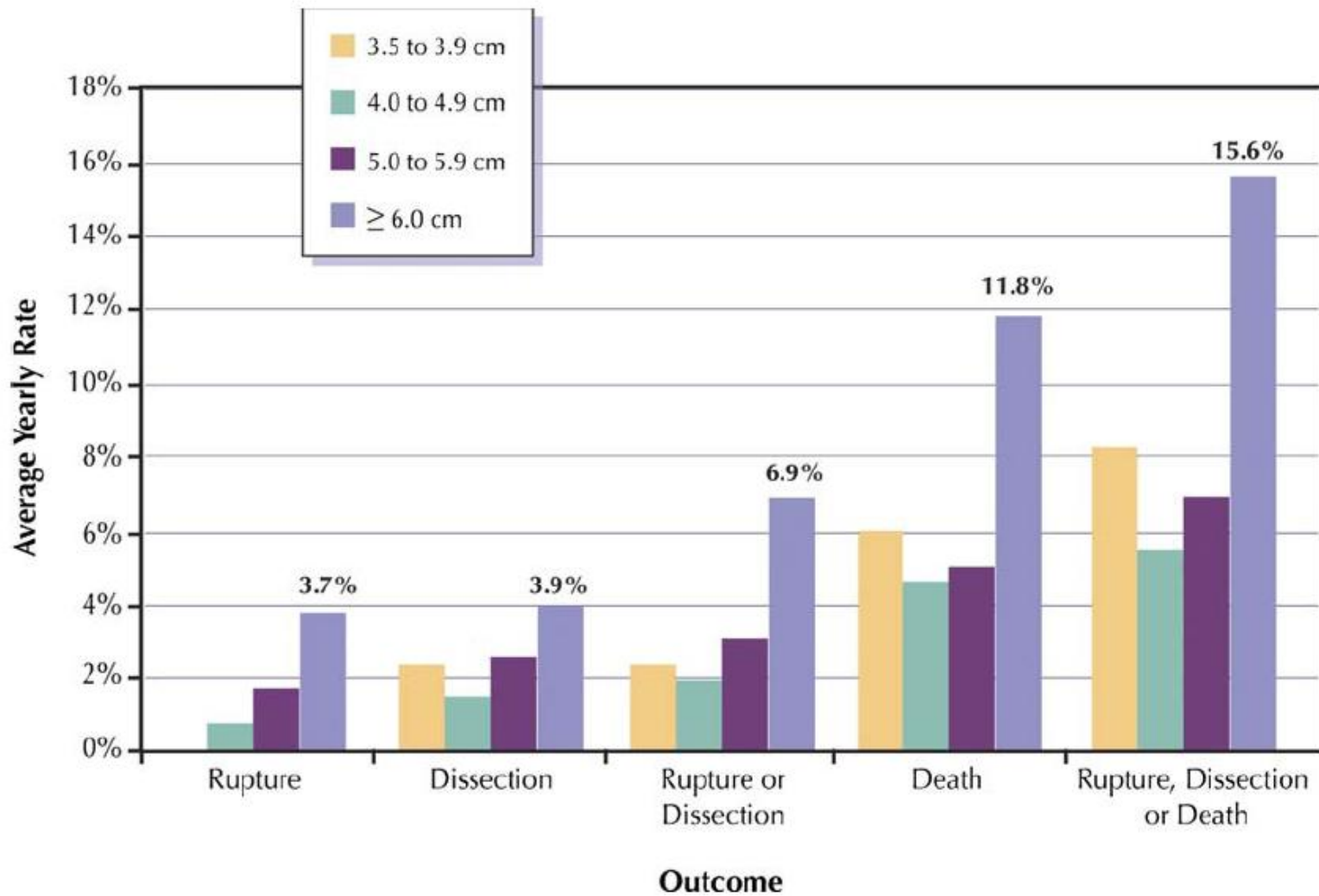
Expansion rate by segment



Depiction of “Hinge Points” for Lifetime Natural History Complications at Various Sizes of the Aorta



J Thorac Cardiovasc Surg 1997;113:476–91

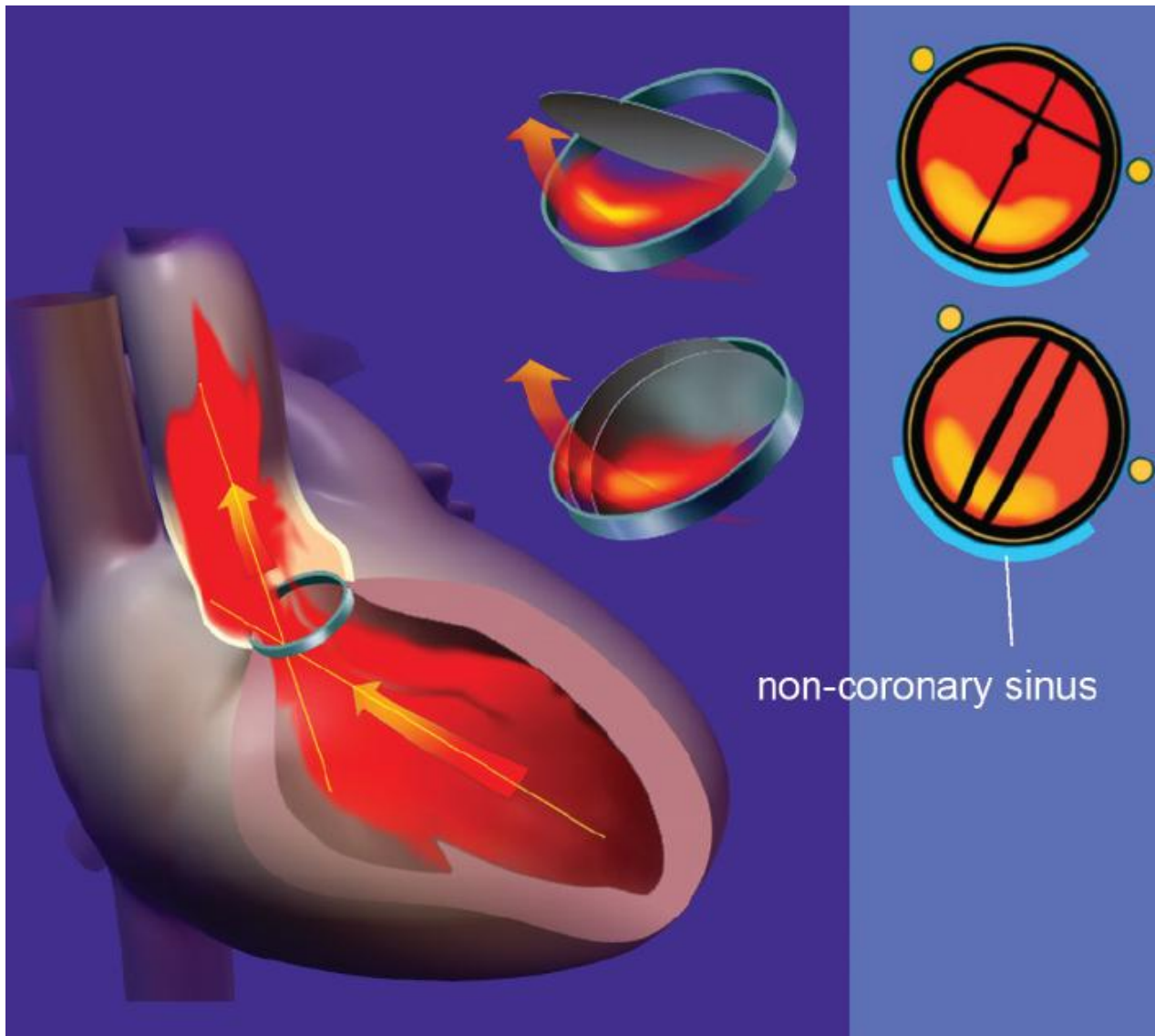


Anna Thorac Surg 2004; 78: 2106-10

Aortic valve replacement with prosthesis

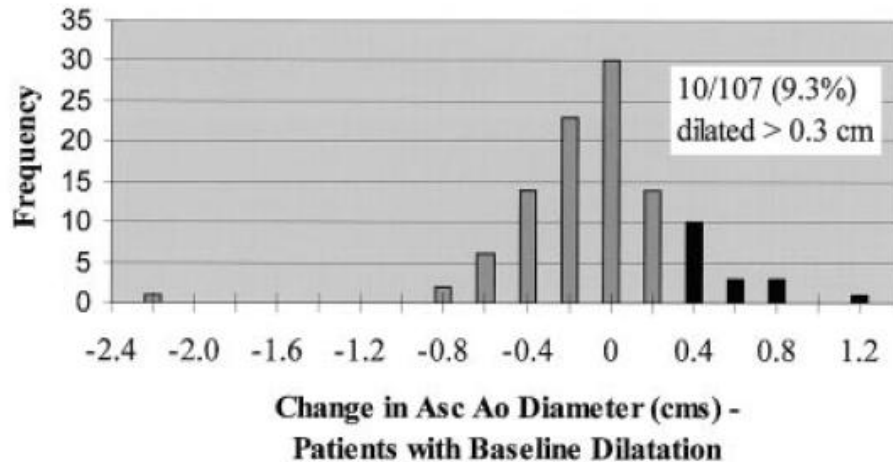
Which effect on aortic root natural history?

- **Aortic evolution : faster ?**
- **The role of prosthesis : biological vs mechanical**
- **The native bicuspid valve**
- **Other genetic cardiovascular disorders**



Correct orientation of mechanical disc and bileaflet valves in aortic position

Stability of Ascending Aortic Dilatation Following Aortic Valve Replacement



Frequency distribution of absolute change in ascending aortic diameter in patients who had ascending aortic dilatation at baseline. The black bars represent patients with ascending aortic dilatation exceeding 0.3 cm.

Comparison With Previous Studies of Ascending Aortic Aneurysm

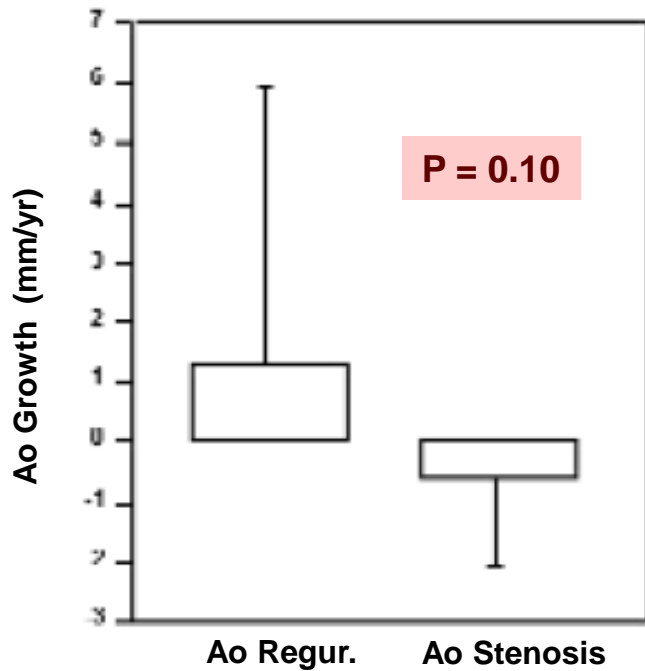
Investigator	Affiliation	Study Size (n)	Follow-up (months)	Expansion Rate (cm/year)
Natural history studies				
Coady et al	Yale	109	29.4	+0.10
Dapunt et al	Mt Sinai	67	18.0	+0.43
Masuda et al	Chiba	14	36.0	+0.13
Hirose et al	Osaka	11	36.0	+0.42
Aortic valve replacement series				
Andrus et al	Dartmouth	107	33.6	-0.10

In summary, our findings have important clinical implications. In patients requiring aortic valve replacement who have accompanying mild or moderate ascending aortic dilatation (3.5 to 4.9 cm), aortic valve replacement alone may be reasonable. Exceptions to this would include patients with a mono- or bicuspid aortic valve, an underlying connective tissue disease, endocarditis, a family history of ascending aortic aneurysm, or a rapidly dilating aorta.

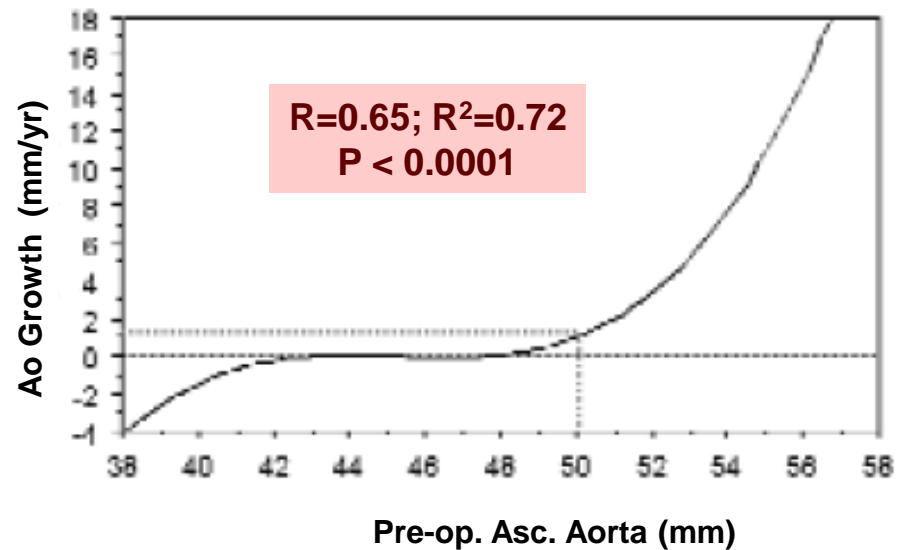
Circulation September 9, 2003

Ectasia of the ascending aorta at the time of aortic valve surgery: replace or relax?

Ital Heart J Vol 6 December 2005

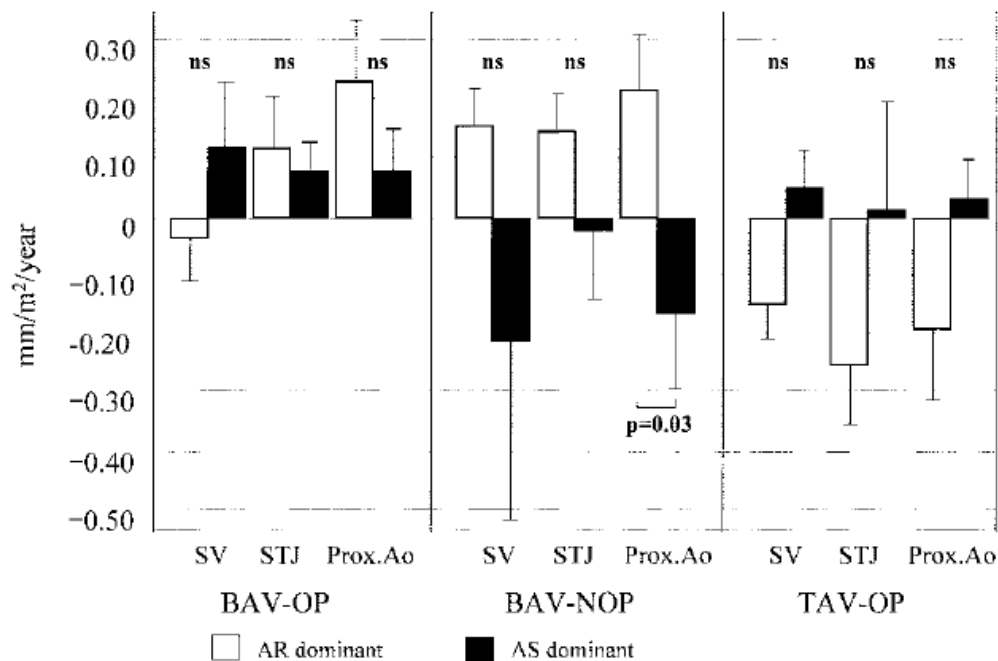


Mean velocity of aortic diameter increase following aortic valve replacement in patients with aortic regurgitation or stenosis.



Extrapolated, theoretical increase of the aortic diameter over time, based on the velocity of aortic diameter increase computed for different diameters obtained immediately before aortic valve replacement

Failure to Prevent Progressive Dilatation of Ascending Aorta by Aortic Valve Replacement in Patients With Bicuspid Aortic Valve: Comparison With Tricuspid Aortic Valve



Effect of aortic stenosis or aortic regurgitation on aortic dilatation. In the patients with BAV, AR dominant group showed more progressive dilatation compared with AS dominant group. In the patients with TAV, the presence of AR or AS before AVR had little effect on the progression.

Conclusions—AVR could not prevent progressive aortic dilatation in BAV. Since the aorta did not dilate in TAV, progressive aortic dilatation in BAV seems mainly due to the fragility of the aortic wall rather than hemodynamic factors. (*Circulation*. 2003;108[suppl II]:II-291-II-294.)

Aortic Complications After Bicuspid Aortic Valve Replacement: Long-Term Results

Fig 1. Kaplan-Meier actuarial survival estimates for A group (BAV) and B group (control). Late aortic dissection and sudden death accounted for a higher late mortality in group A. Open circles = bicuspid; solid circles = control. (BAV = bicuspid aortic valve; pts = patients.)

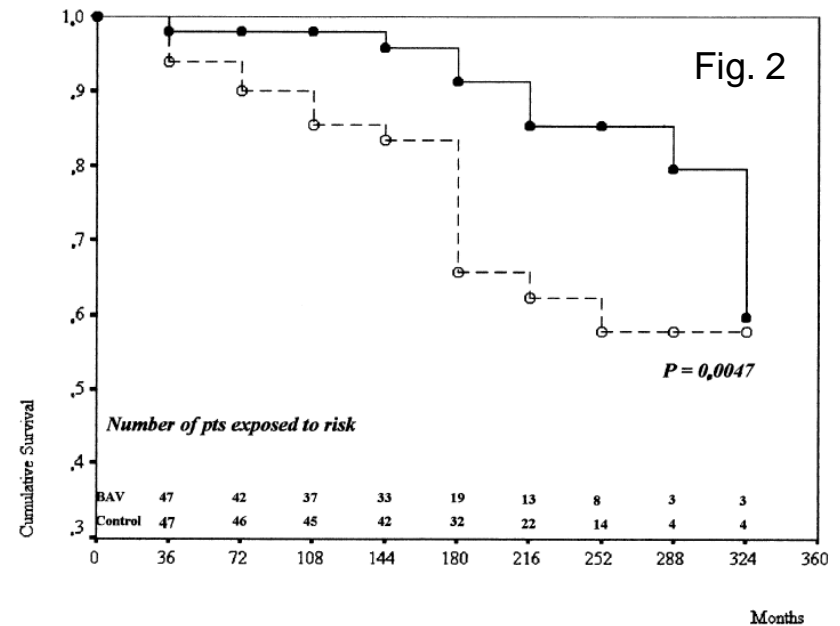
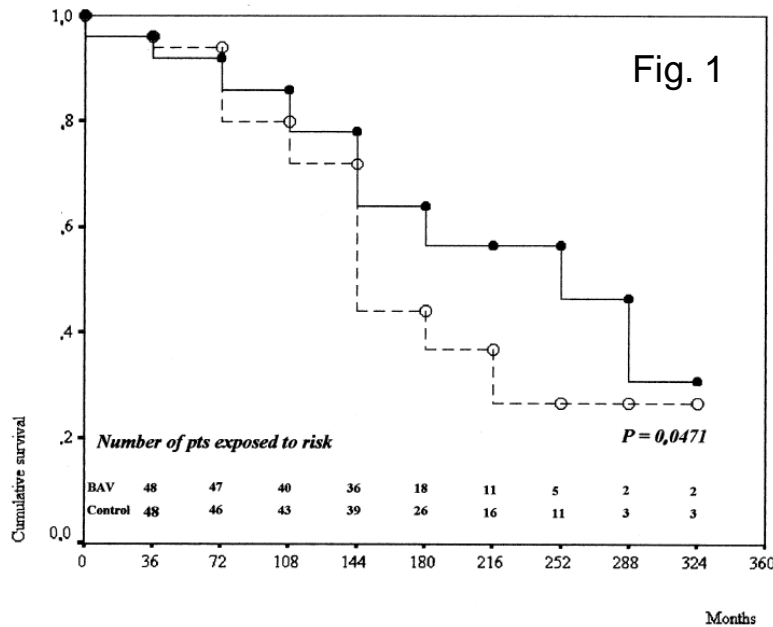


Fig 2. Cardiac-related event survival curve estimates for group A (BAV) and group B (control). The cardiac events include cardiac death, sudden unexplained death, and aortic acute syndrome deaths, and again account for a higher mortality in group A. Open circles = bicuspid; solid circles = control. (BAV = bicuspid aortic valve; pts = patients.)

Guidelines on the management of valvular heart disease (version 2012)

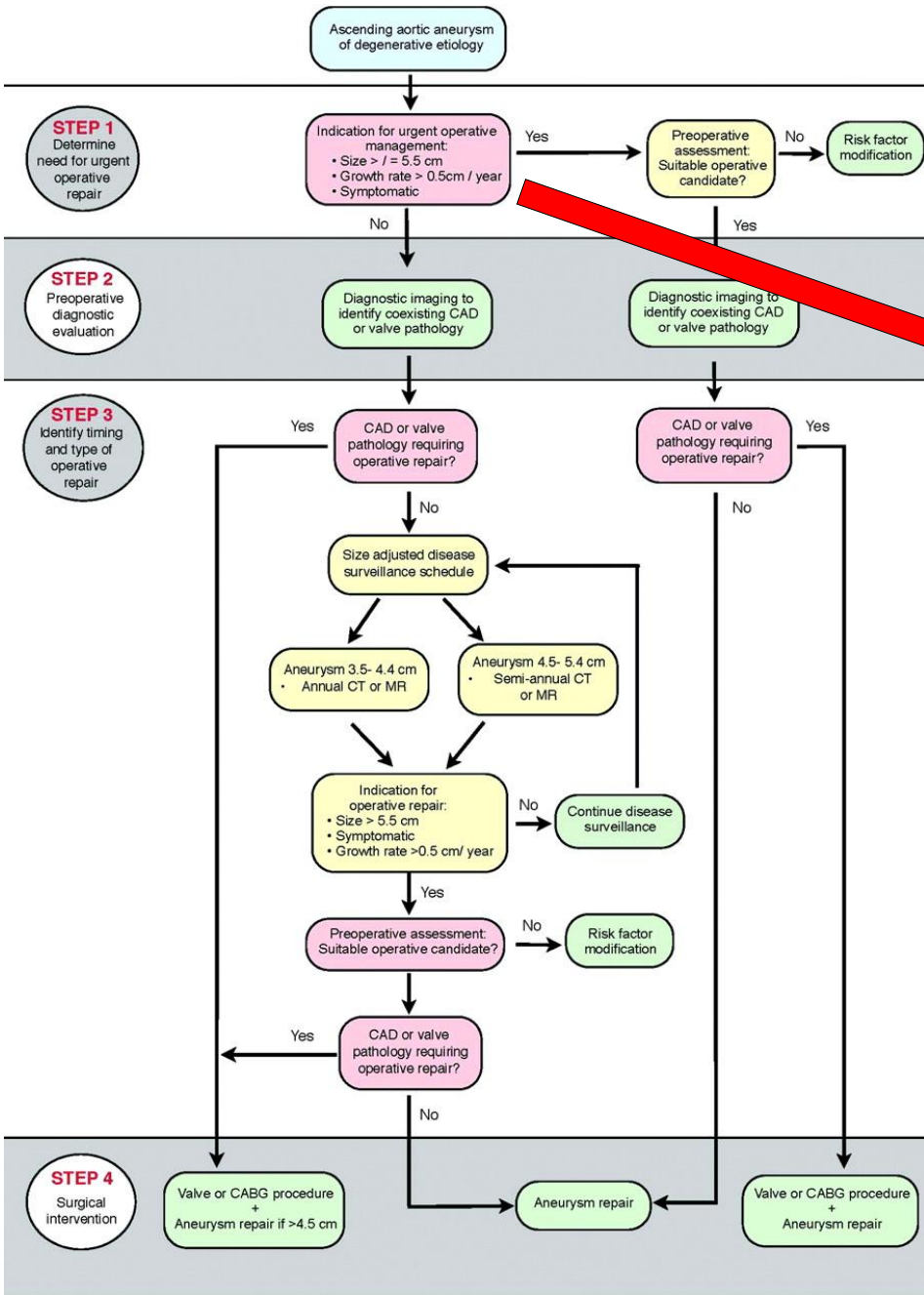
	Class ^a	Level ^b	Ref ^c
A. Indications for surgery in severe aortic regurgitation			
Surgery is indicated in symptomatic patients.	I	B	59
Surgery is indicated in asymptomatic patients with resting LVEF ≤50%.	I	B	71
Surgery is indicated in patients undergoing CABG or surgery of ascending aorta, or on another valve.	I	C	
Surgery should be considered in asymptomatic patients with resting EF >50% with severe LV dilatation: LVEDD >70 mm, or LVESD >50 mm or LVESD >25 mm/m ² BSA. ^d	IIa	C	
B. Indications for surgery in aortic root disease (whatever the severity of AR)			
Surgery is indicated in patients who have aortic root disease with maximal ascending aortic diameter ^e ≥50 mm for patients with Marfan syndrome.	I	C	
Surgery should be considered in patients who have aortic root disease with maximal ascending aortic diameter: ≥45 mm for patients with Marfan syndrome with risk factors ^f ≥50 mm for patients with bicuspid valve with risk factors ^g ≥55 mm for other patients	IIa	C	

^eDecision should also take into account the shape of the different parts of the aorta. Lower thresholds can be used for combining surgery on the ascending aorta for patients who have an indication for surgery on the aortic valve.

^fFamily history of aortic dissection and/or aortic size increase >2 mm/year (on repeated measurements using the same imaging technique, measured at the same aorta level with side-by-side comparison and confirmed by another technique), severe AR or mitral regurgitation, desire of pregnancy.

^gCoarctation of the aorta, systemic hypertension, family history of dissection or increase in aortic diameter >2 mm/year (on repeated measurements using the same imaging technique, measured at the same aorta level with side-by-side comparison and confirmed by another technique).

Ascending aortic aneurysm of degenerative etiology



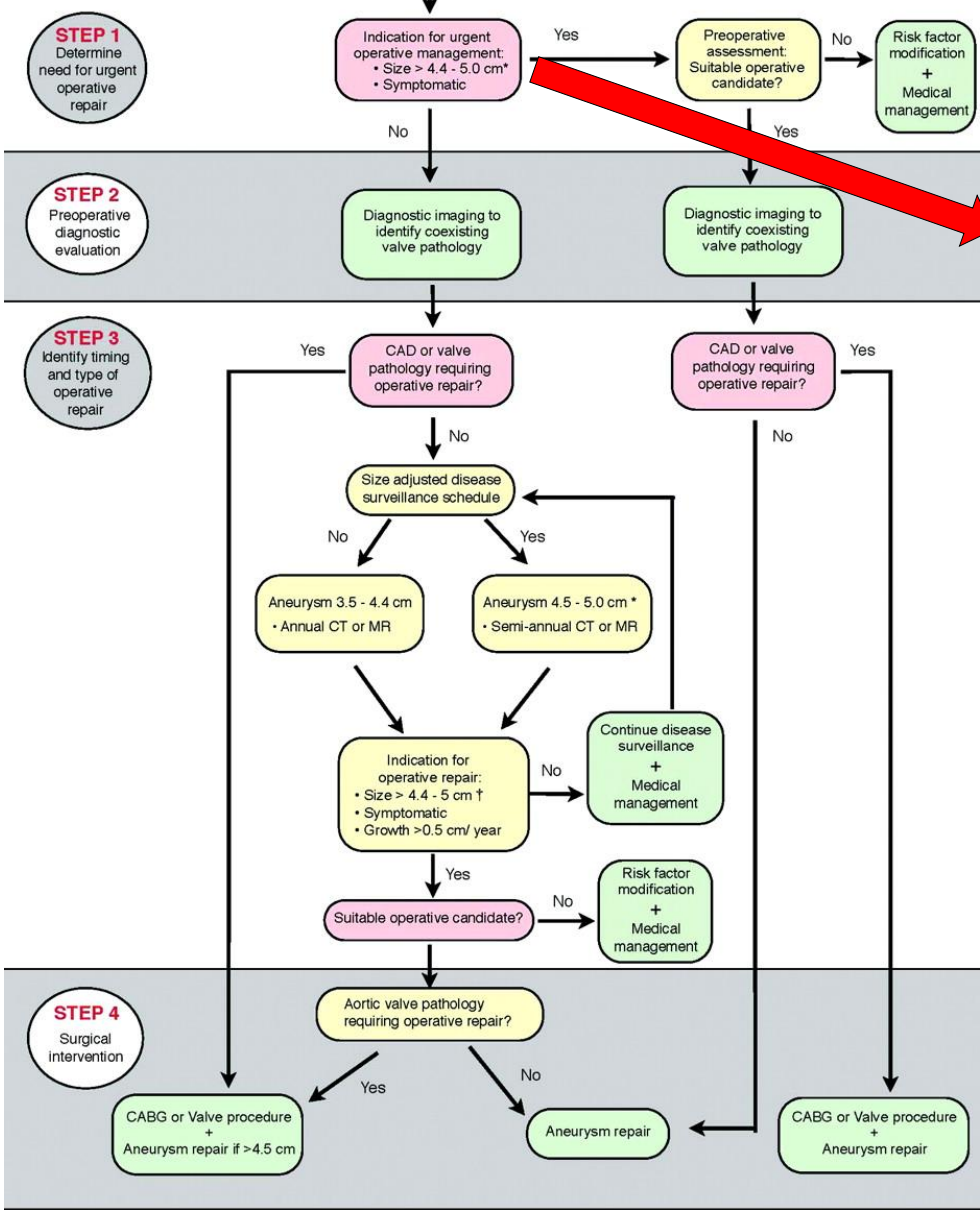
Indication for urgent operative management:

- **Size ≥ 5.5 cm**
- **Growth rate > 0.5 cm/year**
- **Symptomatic**

Ascending aortic aneurysms associated with genetic disorder

Ascending aortic aneurysm associated with:

- Marfan Syndrome
- bicuspid aortic valve
- other genetically mediated disorder



Indication for urgent operative management:

- **Size > 4.4 – 5.0 cm or ratio > 10 (area cmq/h m)**
- **Symptomatic**

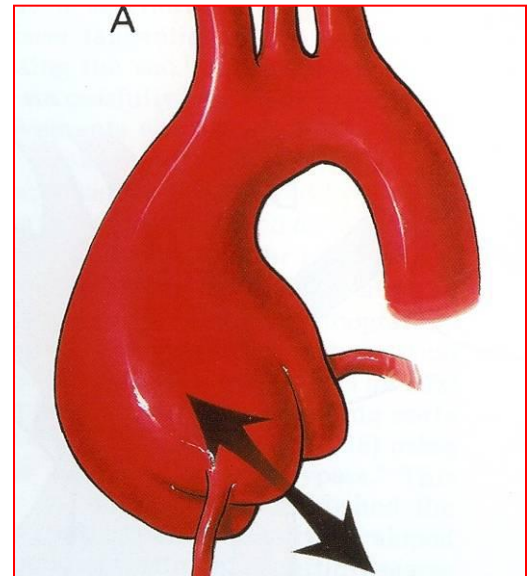
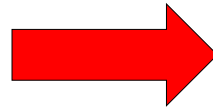
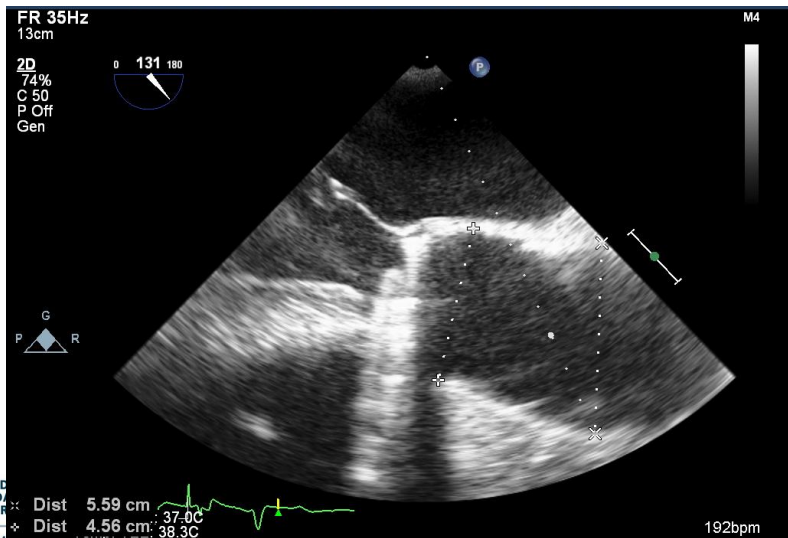
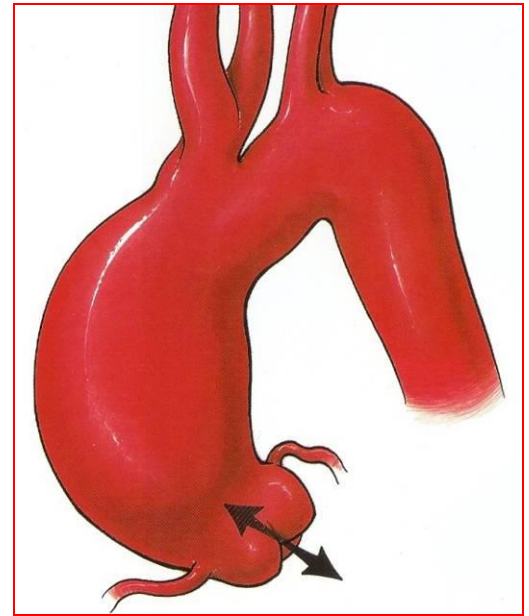
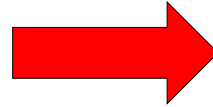
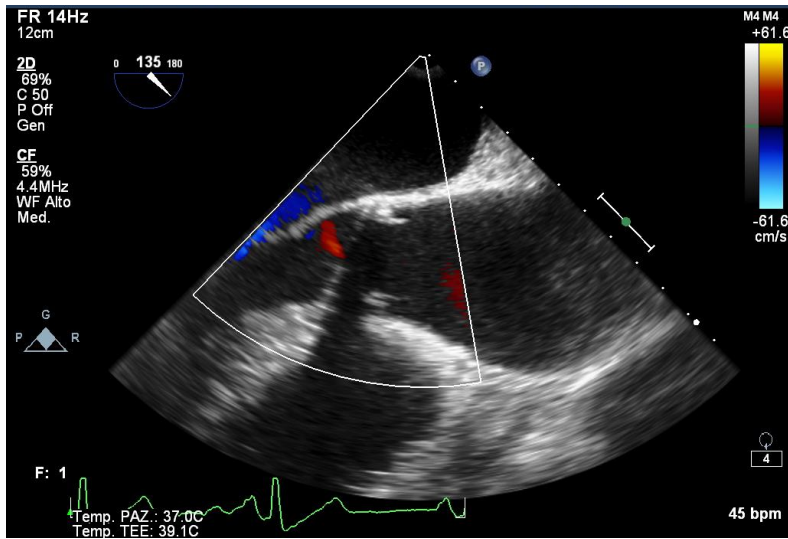
Aortic Size Index Nomogram

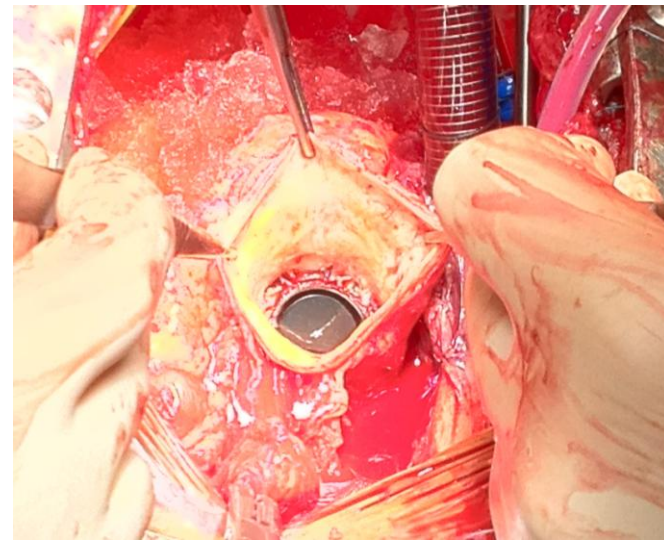
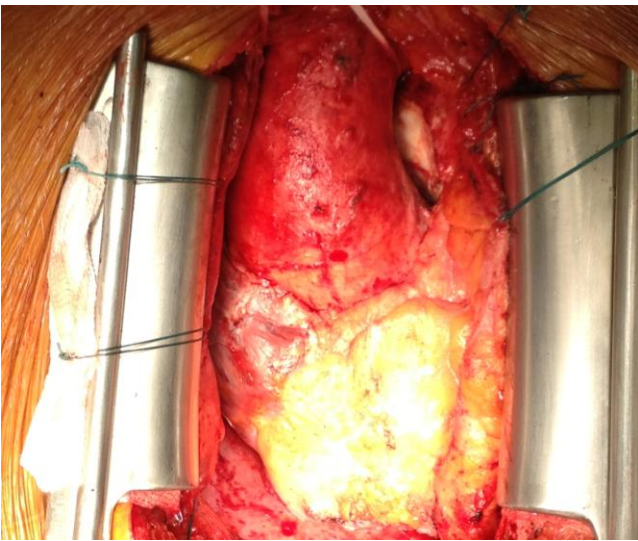
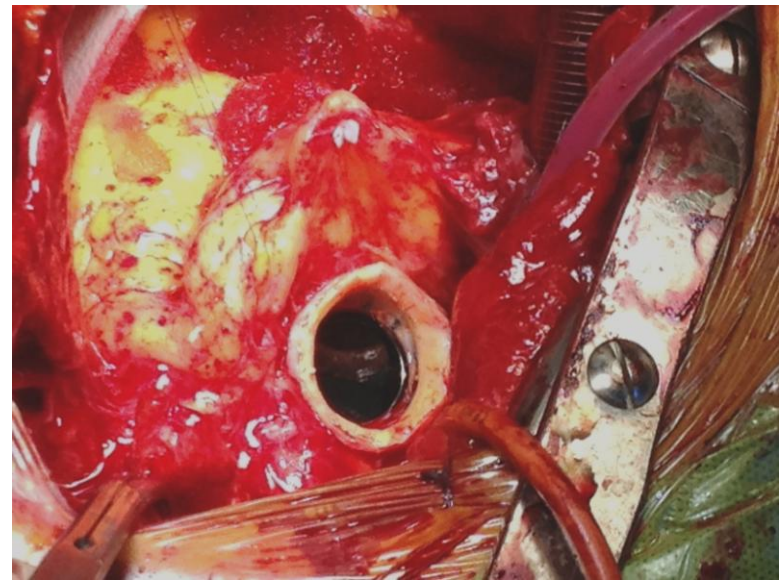
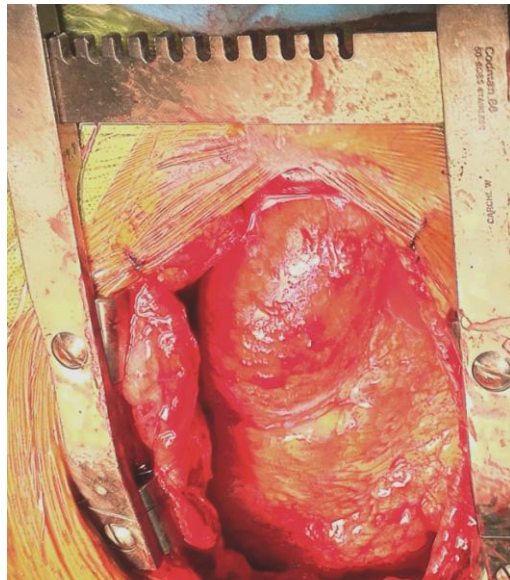
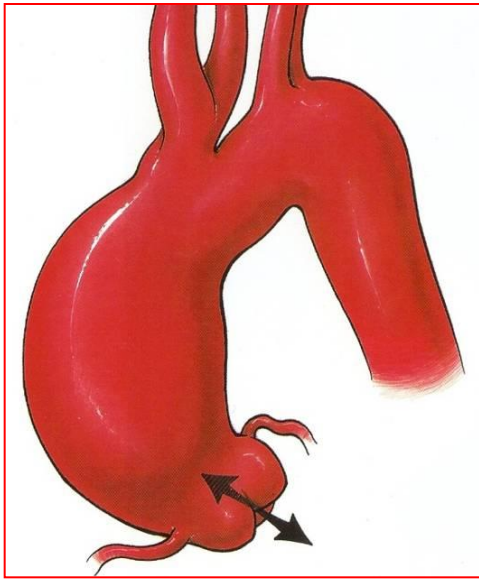
BSA	Aortic size (cm)									
	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
1.30	2.69	3.08	3.46	3.85	4.23	4.62	5.00	5.38	5.77	6.15
1.40	2.50	2.86	3.21	3.57	3.93	4.29	4.64	5.00	5.36	5.71
1.50	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00	5.33
1.60	2.19	2.50	2.80	3.13	3.44	3.75	4.06	4.38	4.69	5.00
1.70	2.05	2.35	2.65	2.94	3.24	3.53	3.82	4.12	4.41	4.71
1.80	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17	4.44
1.90	1.84	2.11	2.37	2.63	2.89	3.16	3.42	3.68	3.95	4.22
2.00	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00
2.10	1.67	1.90	2.14	2.38	2.62	2.86	3.10	3.33	3.57	3.80
2.20	1.59	1.82	2.05	2.27	2.50	2.72	2.95	3.18	3.41	2.64
2.30	1.52	1.74	1.96	2.17	2.39	2.61	2.83	3.04	3.26	3.48
2.40	1.46	1.67	1.88	2.08	2.29	2.50	2.71	2.92	3.13	3.33
2.50	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20

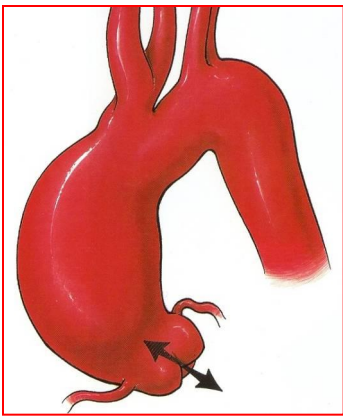
- = low risk (~4% per yr)
- = moderate risk (~8% per yr)
- = severe risk (~20% per yr)

Davies RR et al. Ann Thorac Surg 2006; 81:169

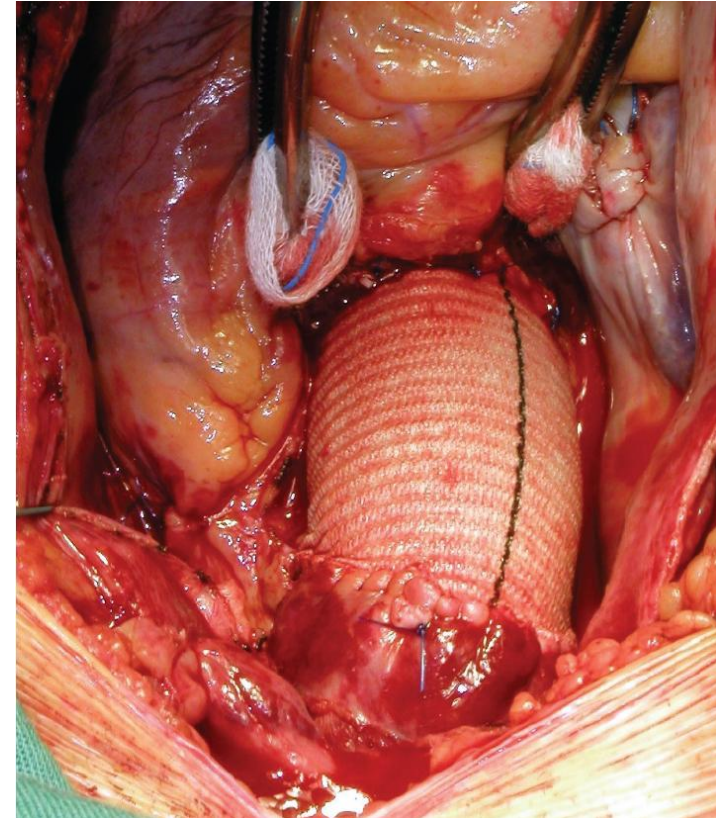
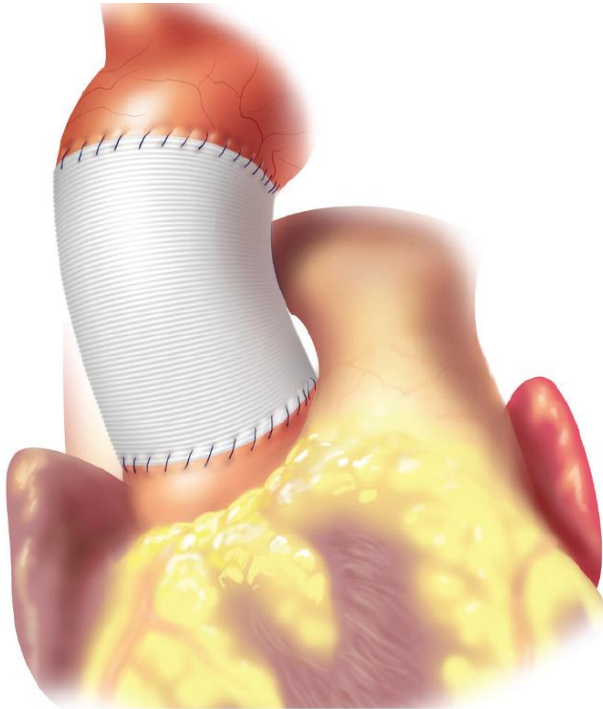
AORTIC DILATATION







ASCENDING AORTA REPLACEMENT



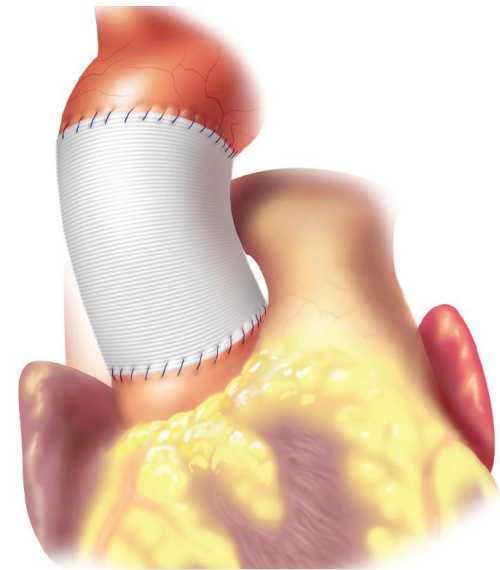
SURGICAL TECHNIQUES

Isolated Ascending Aorta Replacement

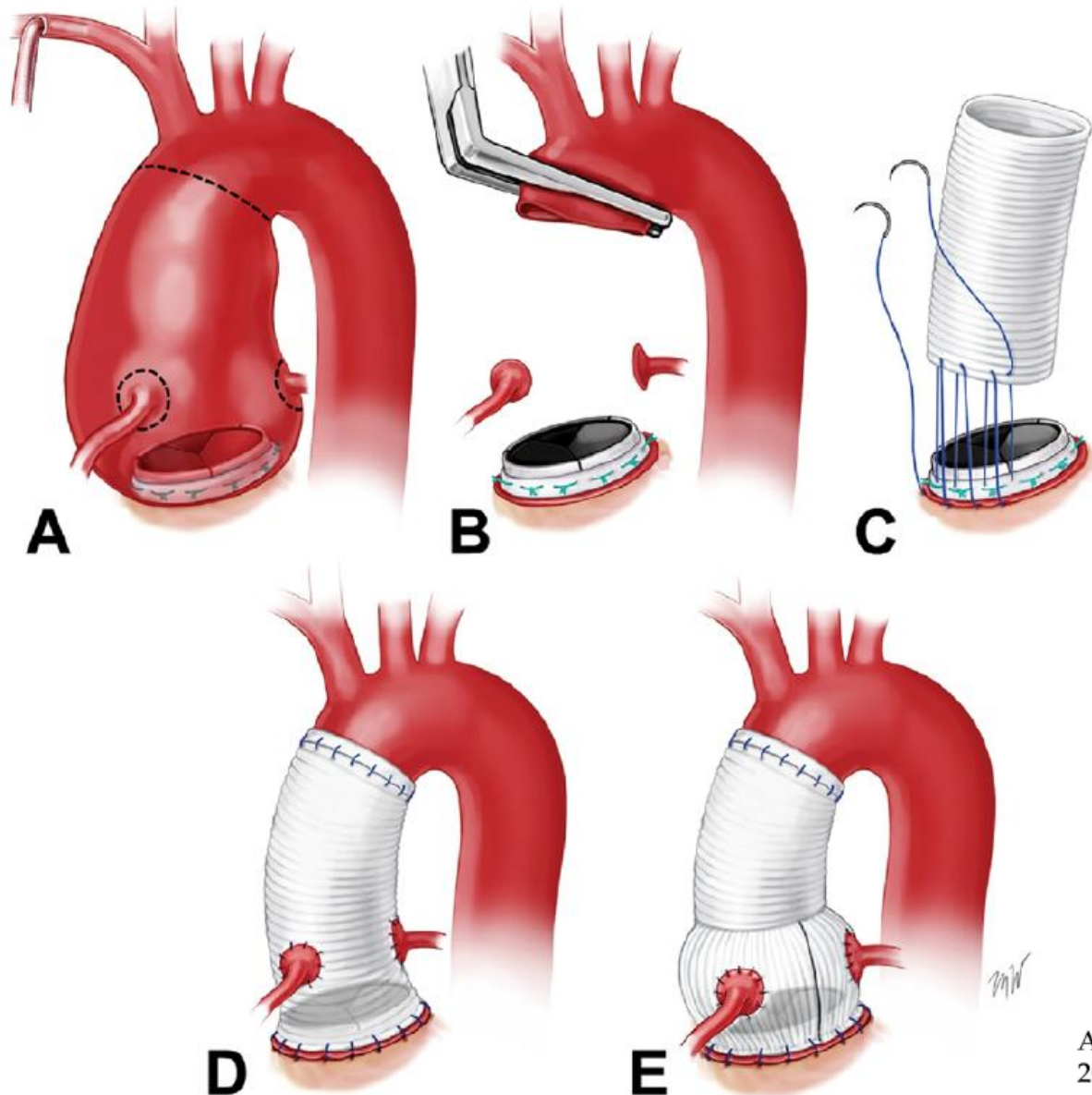
Root and Ascending Aorta Replacement

Leaving the original prosthesis
Or
Replacement with a valve-conduit

- Bentall procedure / BioBentall
- Completion Bentall procedure
- Miniskirt / Double sewing ring technique

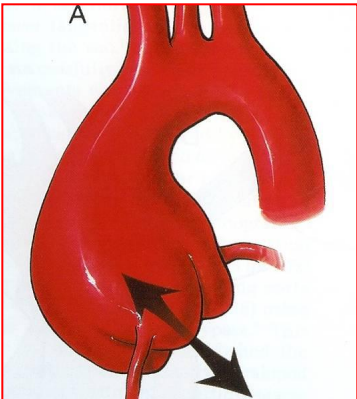


COMPLETION BENTALL PROCEDURE

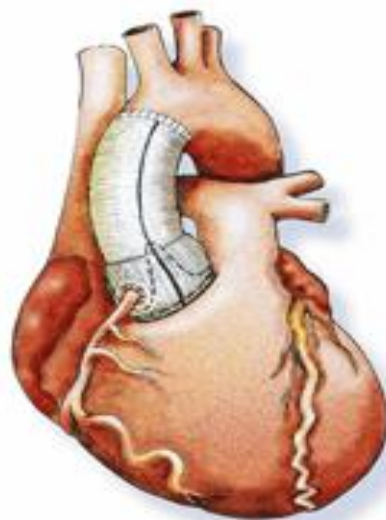


Ann Thorac Surg
2011;92:362-3

BENTALL PROCEDURE



MECHANICAL PROSTHESIS

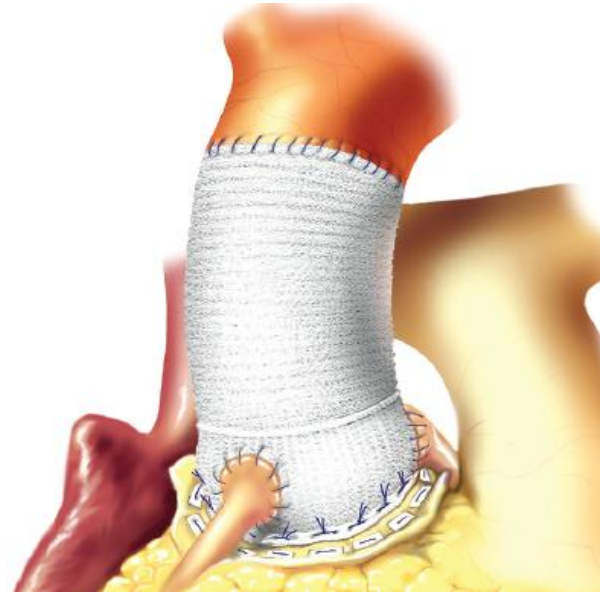
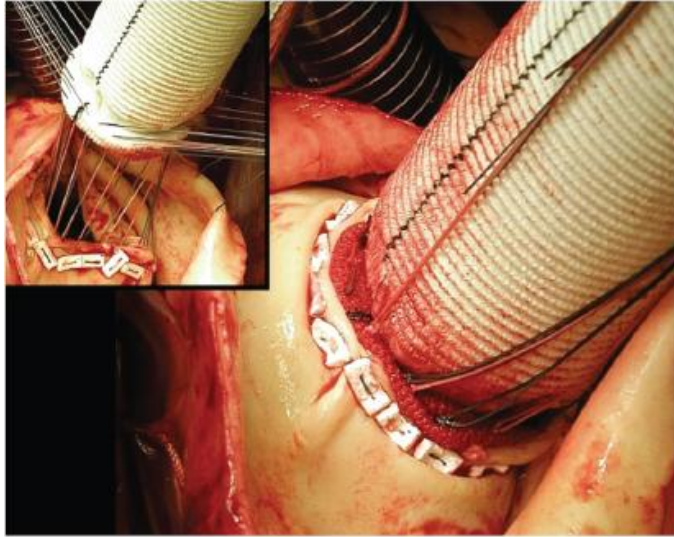


STENTLESS PROSTHESIS

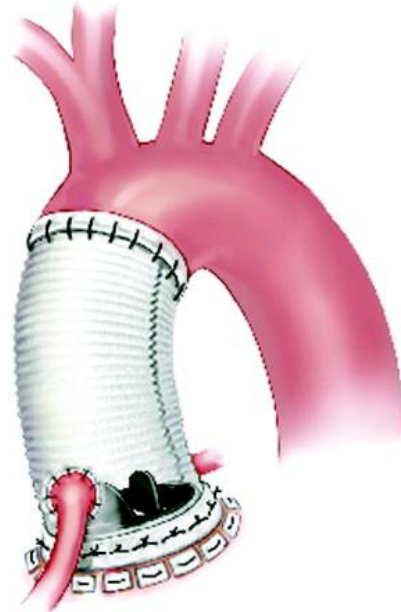


BIOLOGIC PROSTHESIS

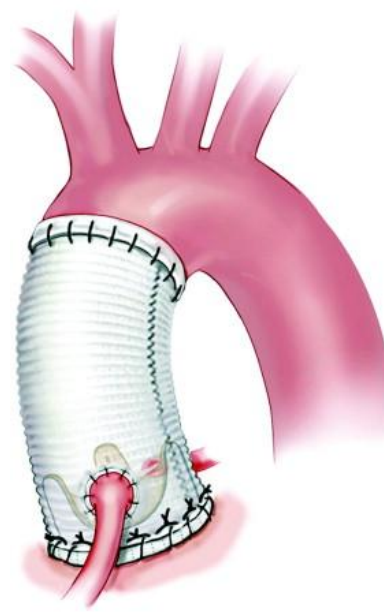
BENTALL PROCEDURE



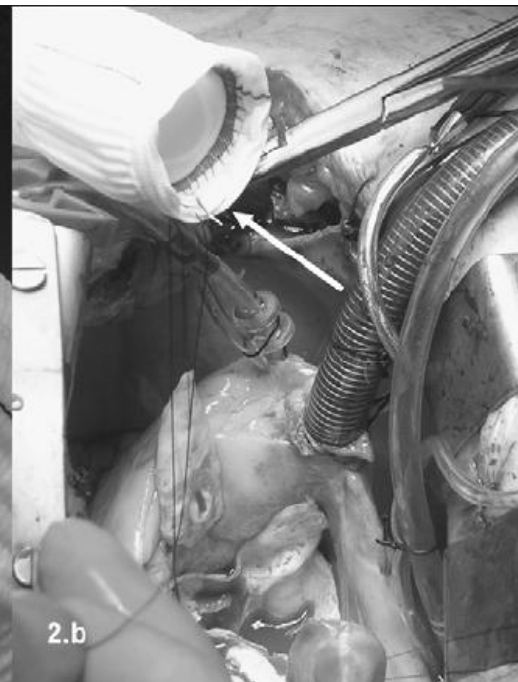
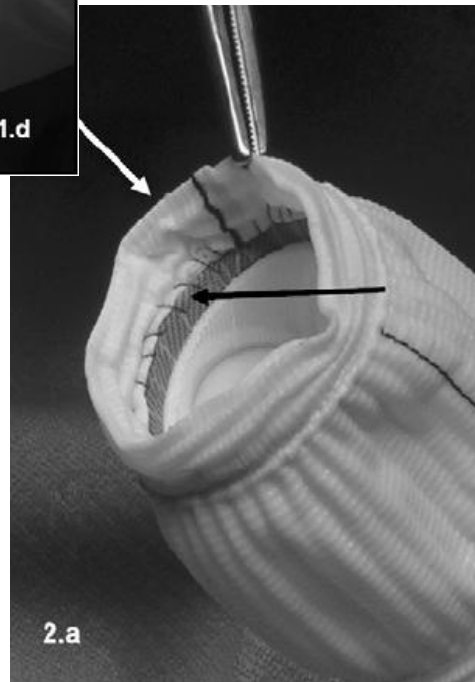
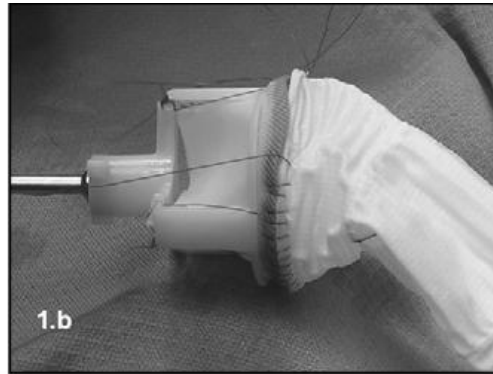
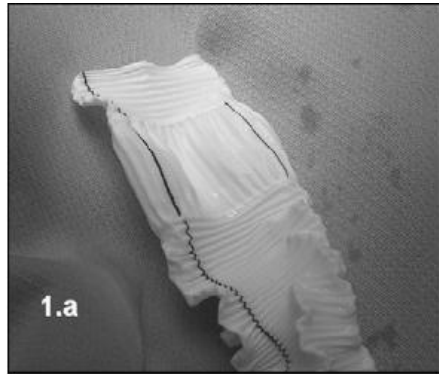
**MECHANICAL
PROSTHESIS**



**BIOLOGICAL
PROSTHESIS**



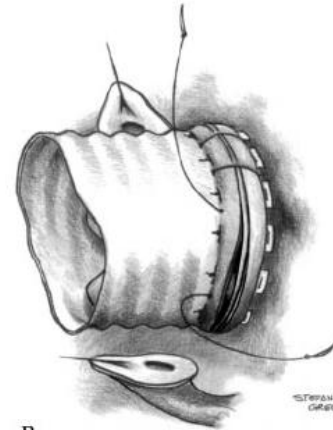
DOUBLE SEWING RING TECHNIQUE



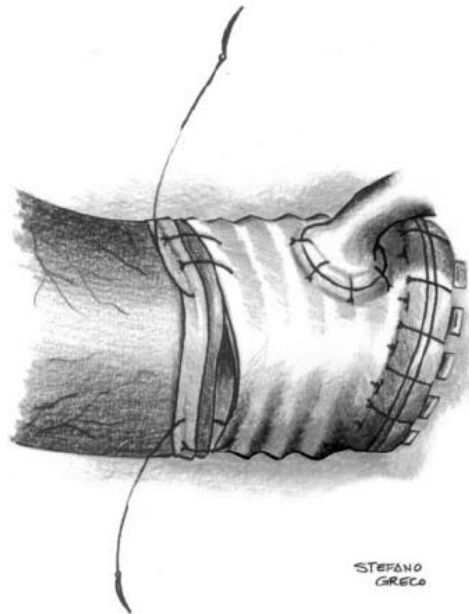
MINISKIRT TECHNIQUE



A



B



C

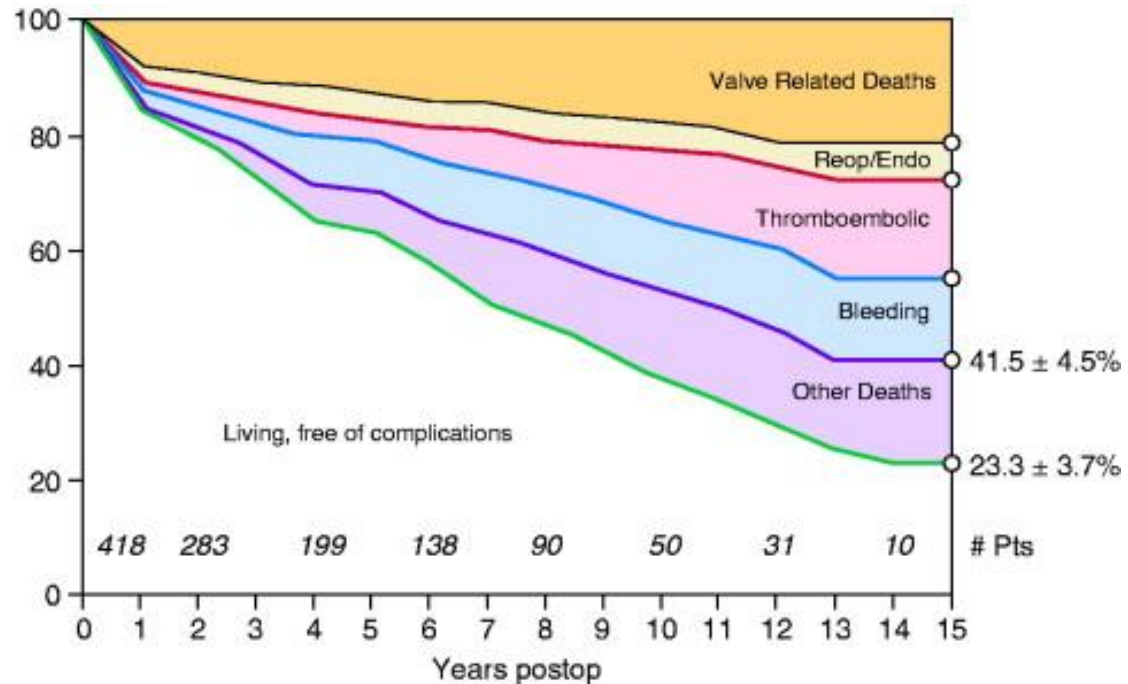
Ann Thorac Surg
2001;72:S1059-64

MECHANICAL PROSTHESIS



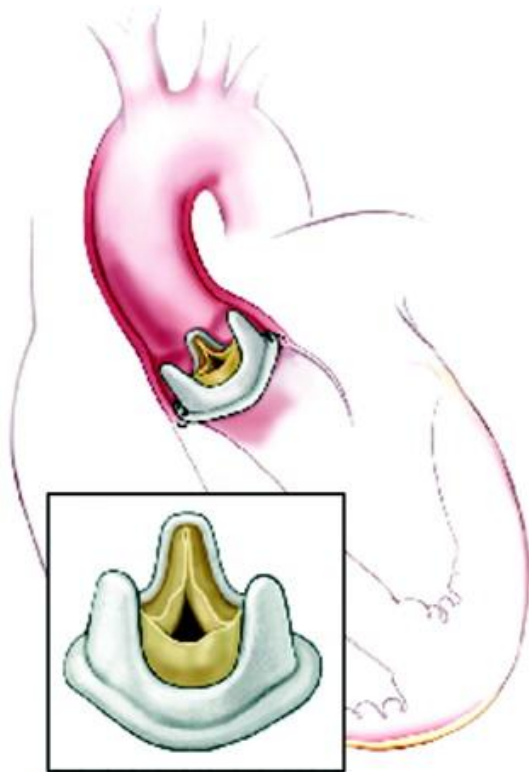
- Too much noise / anxiety
- Thromboembolism / hemorrhage
- Patient-prosthesis mismatch
- Hemolysis
- Patient aging
- Anticoagulant intolerance

Event-free survival with mechanical valve



Ann Thorac Surg 1999; 68: 1210-1218

BIOLOGICAL PROSTHESIS

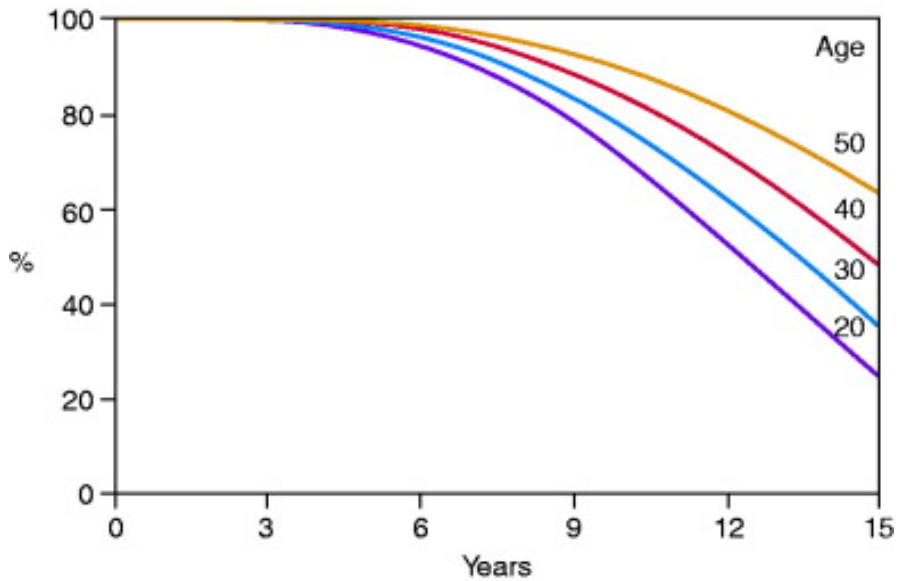


- **Already “appointed”**
- **Expected durability**
- **Patient-prosthesis mismatch**

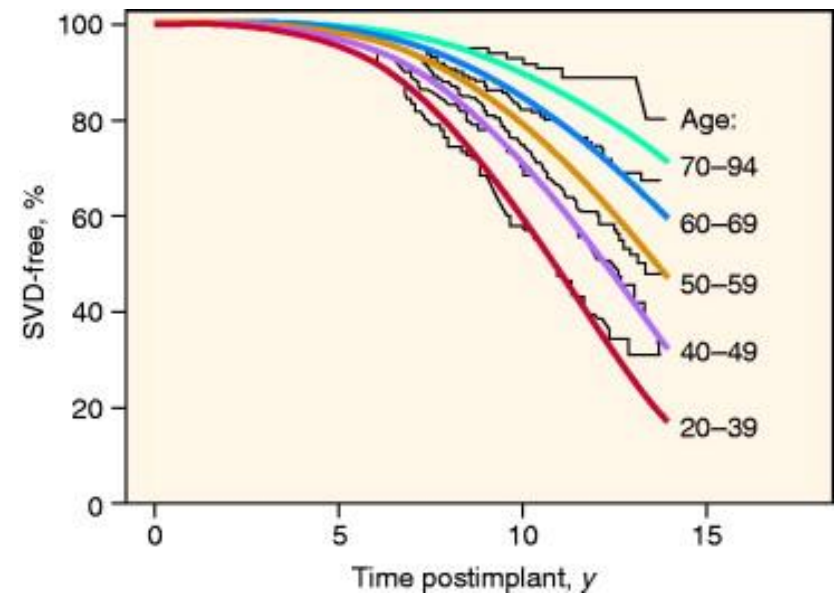
Durability of pericardial valves

Durability of porcine valves

Freedom from structural valve deterioration (SVD)



Curr Probl Cardiol 2003; 28: 417-480



J Thorac Cardiovasc Surg 1994; 108: 709-718

Aortic root replacement after previous surgical intervention on the aortic valve, aortic root, or ascending aorta

Methods: Records of 56 consecutive patients (44 men; mean age, 56.4 ± 13.6 years) undergoing reoperative aortic root replacement between June 1994 and June 2005 were reviewed retrospectively.

Substitute	n (%)
Composite graft	43 (76.8)
Bileaflet mechanical valve	12 (21.4)
Tilting-disc mechanical valve	31 (55.4)
Bioprosthetic stentless aortic root	11 (19.6)
Aortic root homograft	2 (3.6)
Total	56 (100)

Cause of death	Early	Late
Cardiac	8	3
Septic shock (PVE, mediastinitis)	2	—
Suicide	—	1
Subsequent descending thoracic aorta replacement	—	2
Unknown	—	1
Total	10	7

PVE, Prosthetic valve endocarditis.

Hospital Mortality 17.9 %

Conclusion: Reoperative aortic root replacement remains associated with a high postoperative mortality. The need to perform unplanned coronary artery bypass grafting during reoperative aortic root replacement is a major risk factor for hospital death. The optimal technique for coronary reconstruction in this setting remains to be debated.

Redo – AVR / Aortic Root Replacement Higher Operative Risk ?

- **Life expectancy**
- **Comorbidities and Risk Score**
- **Surgical complexity**
- **Patient aging**
- **Alternative treatment : TAVI ?**



Udine, Loggia del Lionello



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