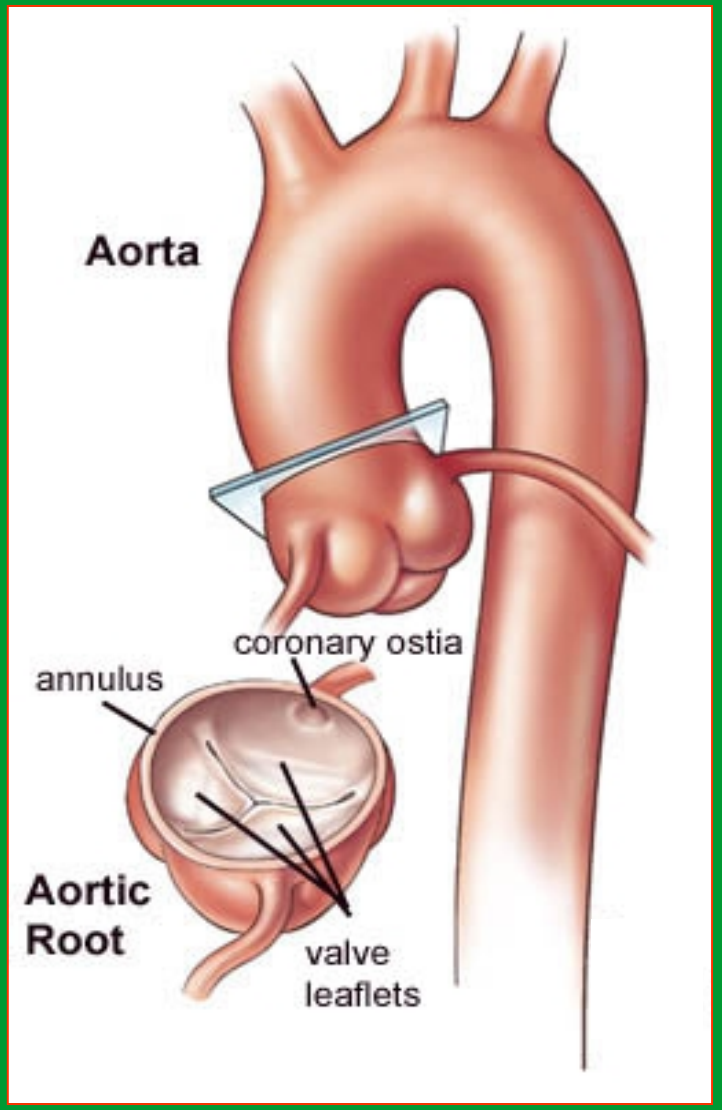
Capitolo 32
Aneurismi cronici dell’aorta

Luigi Chiariello, Paolo Nardi, Giovanni A. Chiariello, Marco Russo

Aortic Root

It's a composite anatomical unit, including:

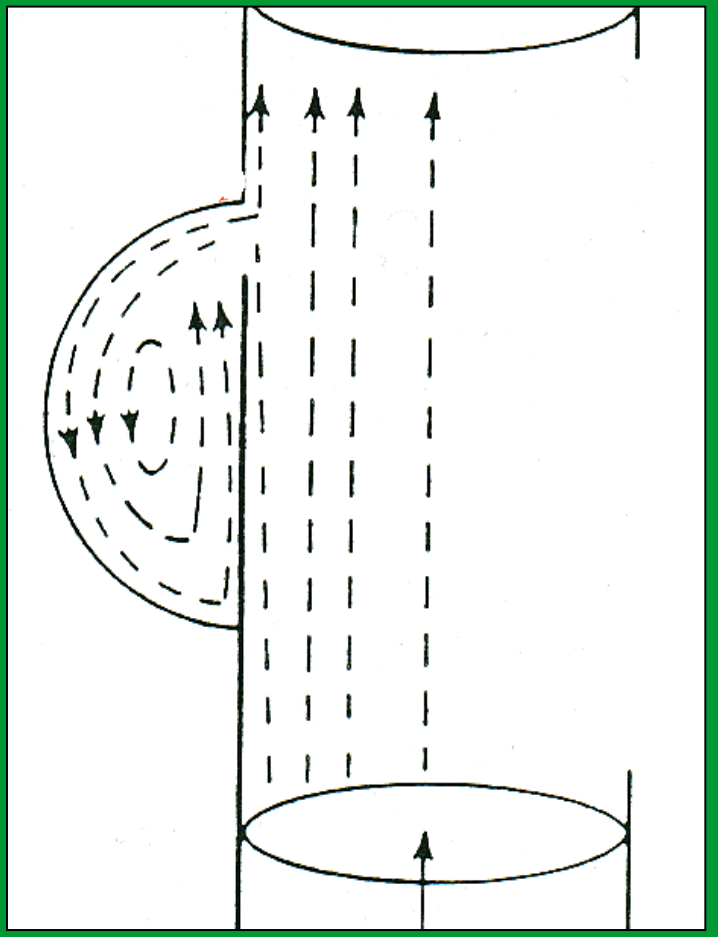
- LVOT and aortic anulus
- Aortic valve
- Valsalva sinuses and coronary ostia
- Sino tubular junction



Aortic Root Physiology

Dynamic interaction of its components allows:

- Antegrade blood flow
- Change of systolic elastic energy into diastolic kinetic energy
- Turbulent flow in sinuses of Valsalva, promoting progressive closure of leaflets, preventing their impact against the aortic wall
- Optimal coronary perfusion



Aortic Root Disease

Pathology

- Marfan Syndrome
- Bicuspid aortic valve
- Degenerative anuloaortic ectasia

Traditional Surgery of the Aorta

- Bentall Operation
- Aortic Valve and Ascending Aorta Replacement
- Isolated Ascending Aorta Replacement

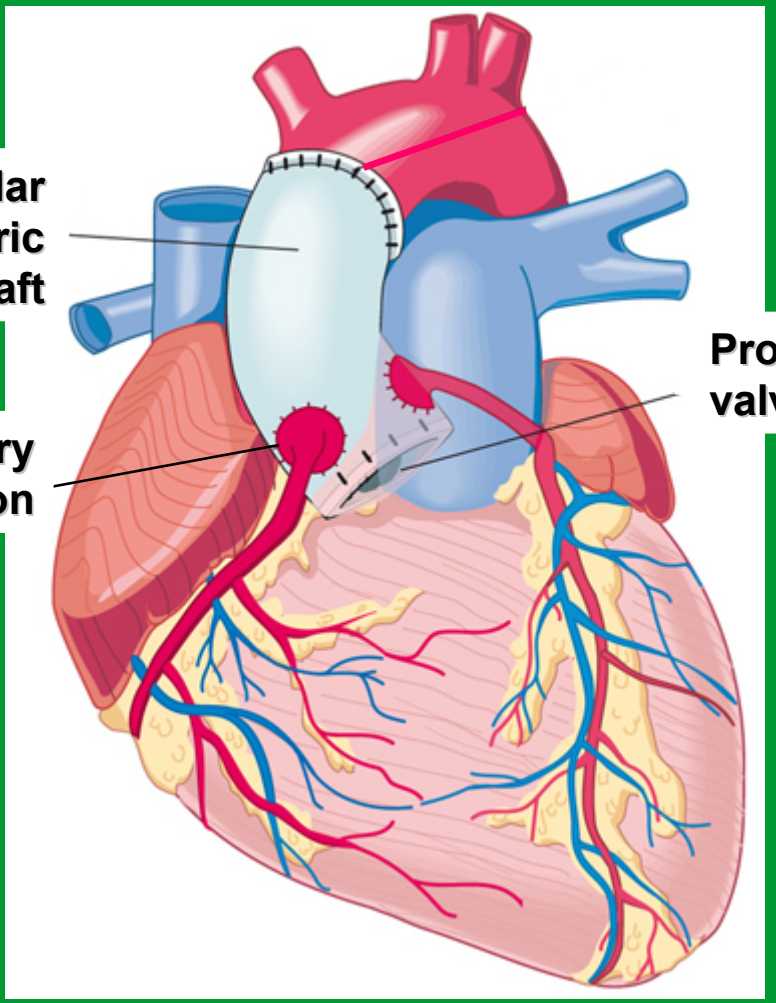
Aortic Root Dilatation

+

Aortic Valve Pathology

Bentall – DeBono Operation

BENTALL OPERATION



BENTALL OPERATION

Advantages

- **Safe proximal anastomosis**
- **No residual aortic regurgitation**
- **Standardized technique**
- **Excellent long-term results**

Disadvantages ***(valve prosthesis related)***

- Life-long anticoagulation *(mechanical v.)*
- Might require reoperation in 15-20 yrs *(biological v.)*

Valve Sparing Operations

Over the past 20 years, two types of procedures have been suggested for treatment of **aortic insufficiency secondary to aortic root pathology in presence of normal leaflets**

Valve Sparing Operations

Operative techniques

- Aortic Valve Reimplantation
- Aortic Root Remodeling

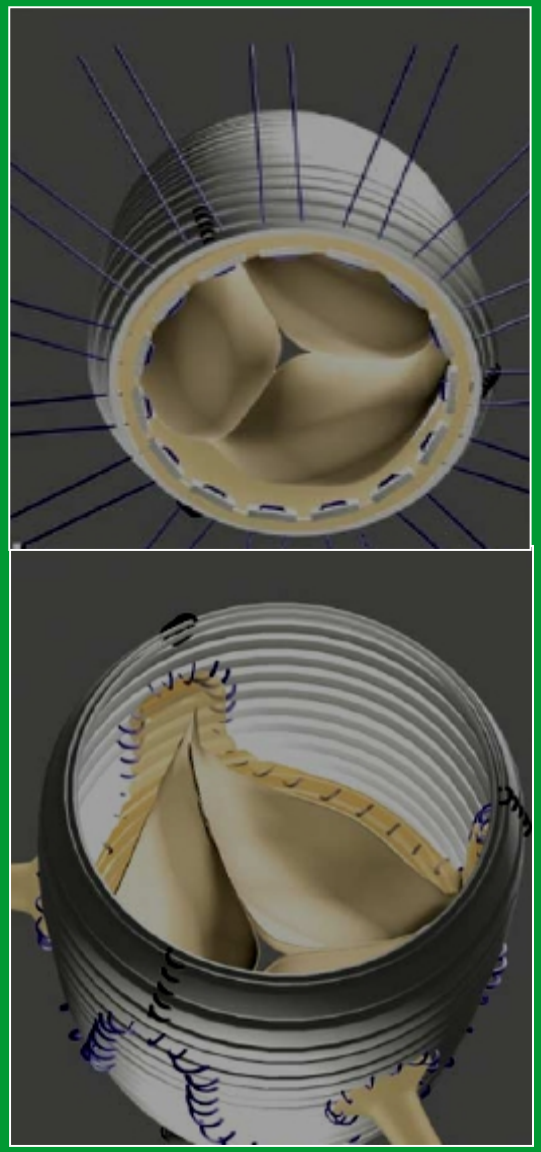
David TE, J Thorac Cardiovasc Surg, 1992
Yacoub M, J Thorac Cardiovasc Surg, 1993

YACOUB REMODELING

Normal Aortic Root Reconstruction and sparing of aortic valve

Disadvantage: no fixation of the aortic anulus
(may predispose to recurrent AR)

David Type I Reimplantation



Advantages

- Safe proximal anastomosis
- Maximum stabilization of the base of the aortic root (vs. Yacoub)

Disadvantage

- Potential systolic cusps stress into the cylindric tube graft (vs. Yacoub)

Aortic Root Surgery

Indications to aortic valve replacement or sparing

- Bentall operation for >50 mm Ø aneurysm
- **Valve-sparing operations** for <50 mm Ø aneurysm *(preserved valve cusps integrity)*

David TE, Adult Cardiac Surg 2008

Valve sparing operations: Reimplantation vs. Remodeling

Ten-year results

(220 aortic valve sparing operations)

- **Survival and Freedom from reoperation:**
  88% and 95% for all patients
- **Freedom from mod.-severe AR:**
  ***94%** Reimplantation vs. **75%** Remodeling* *(p=0.04)*

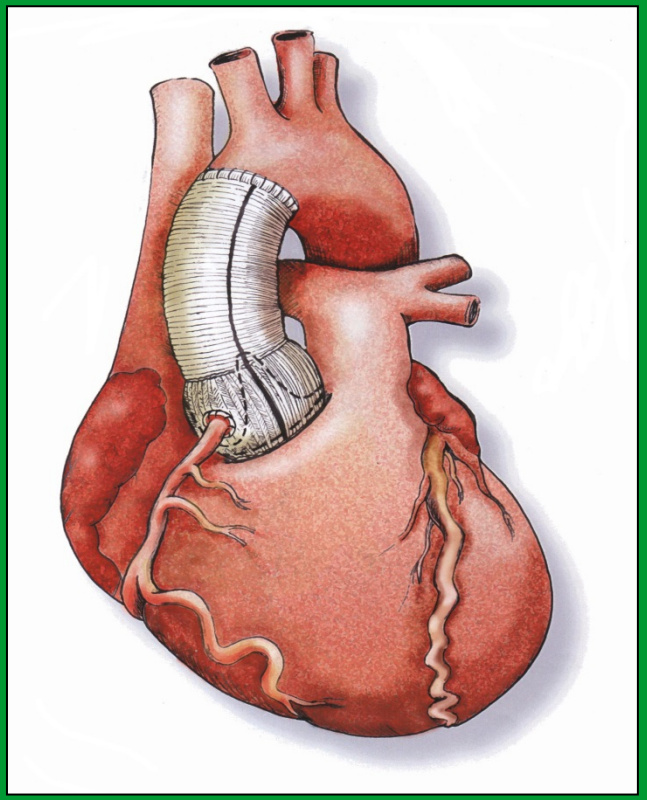
David TE, J Thorac Cardiovasc Surg 2006

New Insights

into David Valve-Sparing Operation

The Tor Vergata University of Rome
Valsalva Aortic Root Graft ***(since 2000)***

To achieve a "closer-to-normal" aortic root morphology, thus reducing the mechanical stress on the aortic valve leaflets In the David reimplantation



NEW INSIGHTS INTO VALVE-SPARING TECHNIQUES

Ascending aorta replacement

+ *Aortic Valve Repair*

Aortic Valve Repair

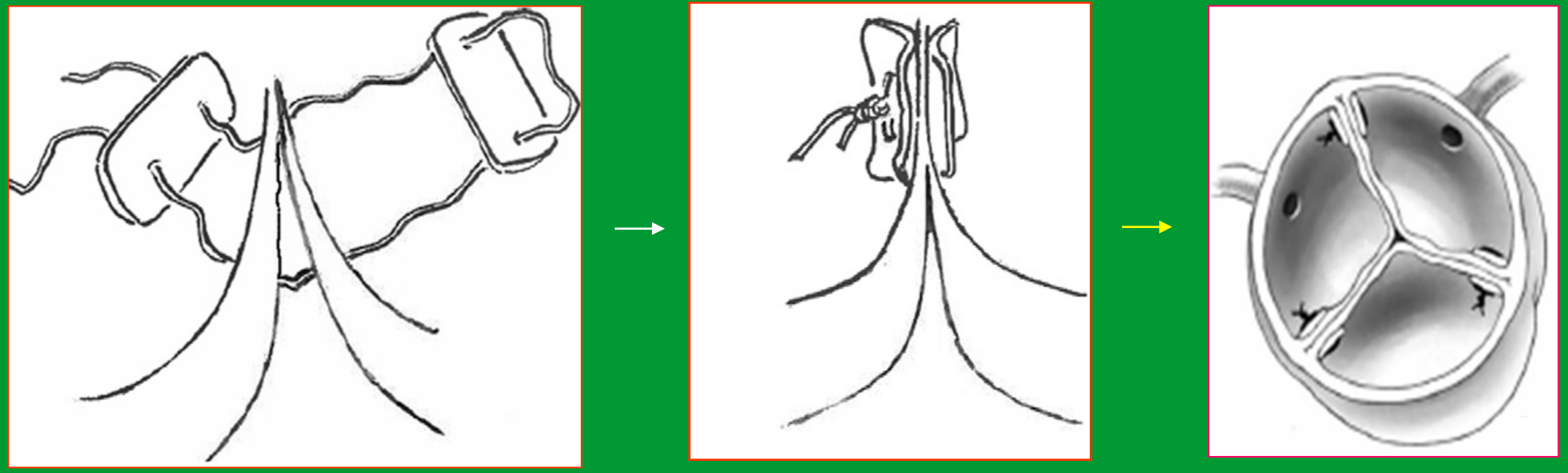
Surgical Indication

- Normal aortic annulus
- Aortic cusps normal or near to normal
- Valsalva sinuses normal or

  with dilation < 50 mm (in absence of Marfan, Family S.)

Aortic Valve Repair

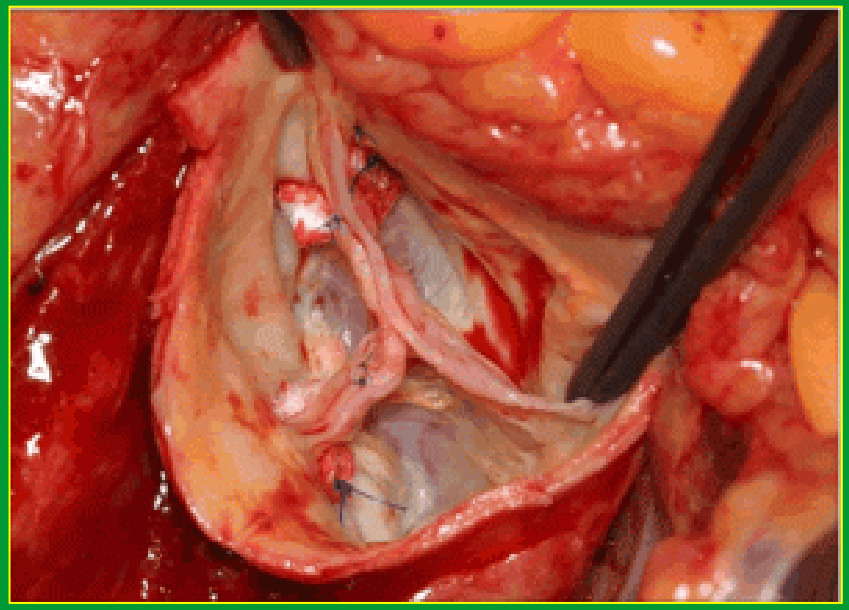
Subcommissural Aortic V. Annuloplasty



Chiariello L et al, Ann Thorac Surg 2013

Aortic Valve Repair

Subcommissural Aortic V. Annuloplasty



Chiariello L et al, Ann Thorac Surg 2013

Ascending Aortic Aneurysm Surgery

Tor Vergata University of Rome

(1992-11.2014)

Type of Operation	No. Pts.	
Ascending Aorta Replacement + AVR	345	
Bentall	366	
Reductive Aortoplasty + AVR	88	
Ascending Aorta Replacement ± Aortic Valve Repair	536	
Valve Sparing Operations:	98	*44%*
Yacoub Remodeling (until '00)	*31*	
David Reimplantation	*67*	
Total	*1433*	

Operative mortality 1% Valve-sparing proc. vs. 3-4% Ascending Ao. Repl.+AVR / Bentall

Bentall vs. Valve Sparing

reserved to sicker patients:

- Age ↑ *(p=0.001)*
- NYHA ↑ *(p=0.001)*
- Diseased aortic valve *(p=0.01)*
- Aortic anulus ↑ *(p=0.01)*
- Enlarged LV *(p=0.02)*
- Redo *(p=0.002)*

Nardi P et al, Heart Surg Forum 2006

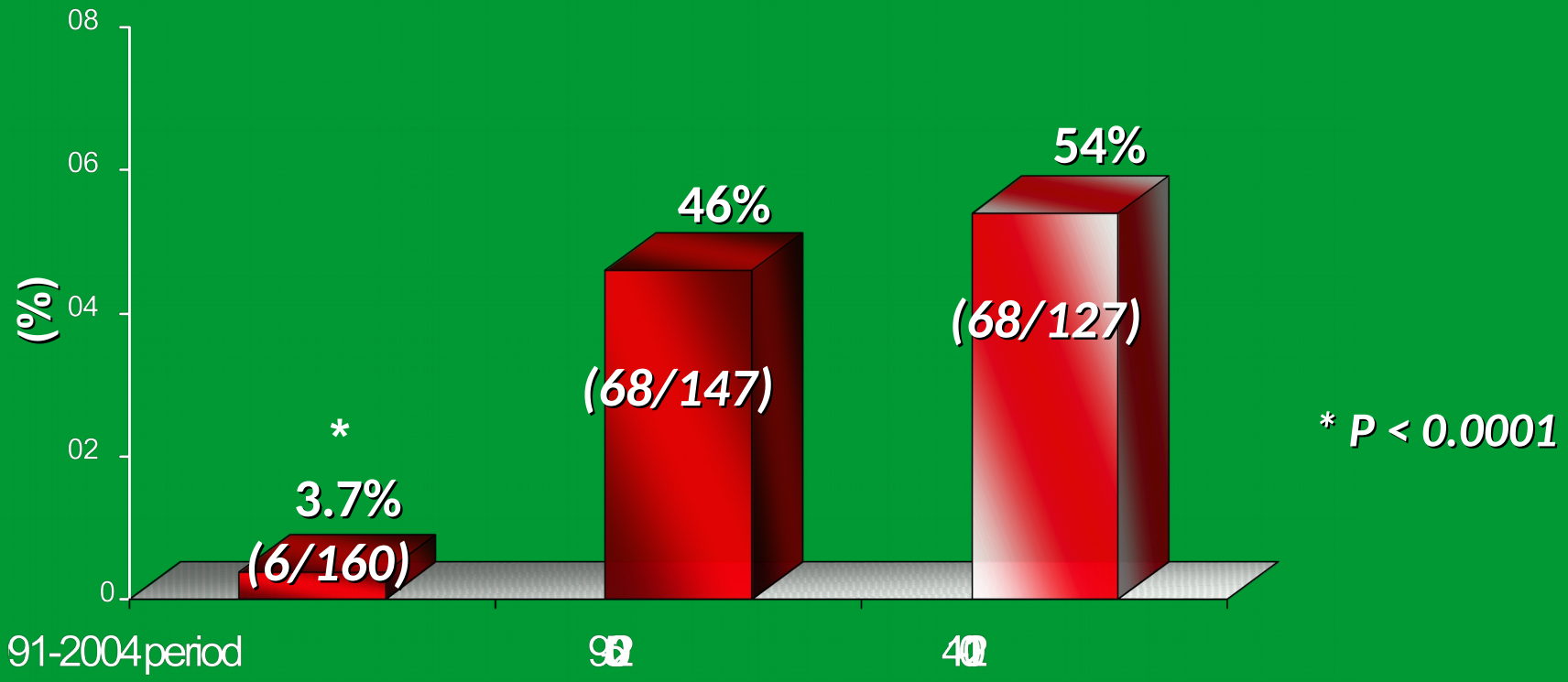
BENTALL OPERATION

Excellent Results *(No. pts 300)*

Operative Mortality	4%
<u>>15-year Results</u>:	
Survival	81 ± 5%
Freedom from Cardiac Death	92 ± 4%
Freedom from Thromboembolism	90 ± 6%
Freedom from Major Bleeding	95 ± 5%
Freedom from Reoperation	97 ± 1%

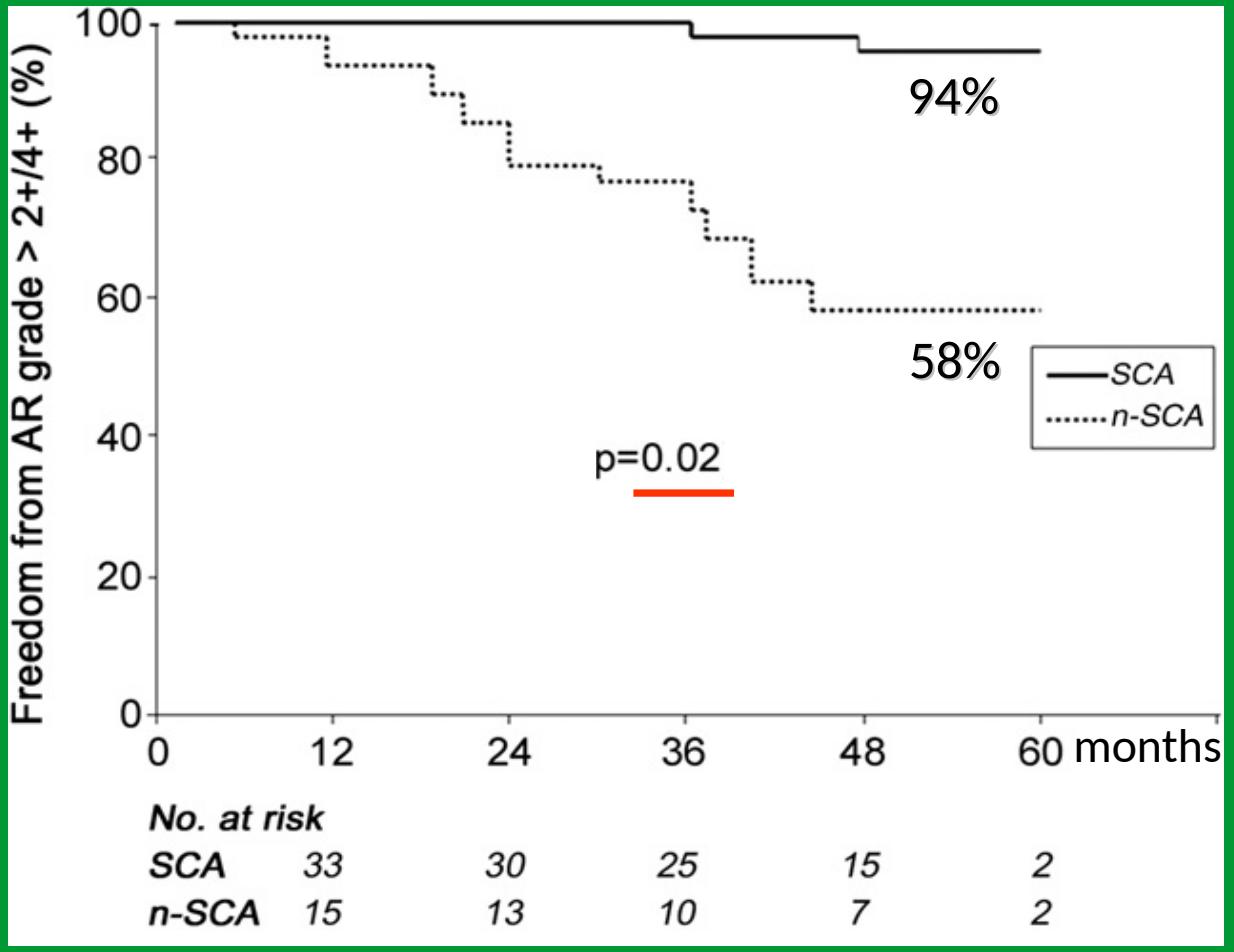
Nardi P et al, ESCVS Congress 2012

Aortic Valve Repair
in aortic root – ascending aorta surgery



Aortic Valve Repair and Ascending Aorta Replacement

(subcommissural annuloplasty, SCA)



Mve Mvondo C et al, Ann Thorac Surg 2013

AORTIC VALVE REPAIR

- Effective to treat functional significant AR and to stabilize the aortic root
- Associated with less recurrence of AR at mid-term period

Mve Mvondo C et al, Ann Thorac Surg 2013

BICUSPID AORTIC VALVE (BAV) AND ASCENDING AORTA ANEURYSM

3 different surgical techniques (*No. 150 pts, 2005-11*)

- **Bentall operation (aortic root >45 mm and malfunctioning BAV) (Group 1, 46 pts)**
- **Separate Ascending Ao. and Aortic Valve Replacement (aortic root <45 mm and malfunctioning BAV) (Group 2, 77 pts)**
- **Ascending Ao. Replacement +/- BAV repair (aortic root <45 mm and normal functioning BAV) (Group 3, 27 pts)**

Nardi P et al, Ann Thorac Surg 2013

5-Year Results

Complications during follow-up

	Group1 (n=43)	Group2 (n=73)	Group3 (n=26)	*p* Value
Late death, n.(%)	3(7.0)	5(6.8)	0	0.3
Late cardiac death, n.(%)	0	1(1.4)	0	0.6
Thromboembolic events, n.(%)	1(2.3)	2(2.7)	1(3.8)	0.7
Major bleedings, n.(%)	1(2.3)	0	0	0.3
Endocarditis, n.(%)	1(2.3)	1(1.4)	1(3.8)	0.7
Need for pacemaker implantation, n.(%)	2(4.6)	4(5.5)	0	0.4
Redo operation, n.(%)	0	0	0	-
Aortic dissection or rupture (documented), n.(%)	0	0	0	-

BICUSPID AORTIC VALVE REPAIR

In absence of aortic valve disease

***BAV** sparing operations (aorta replacement +/- valve repair or sparing)*

appear as safe techniques

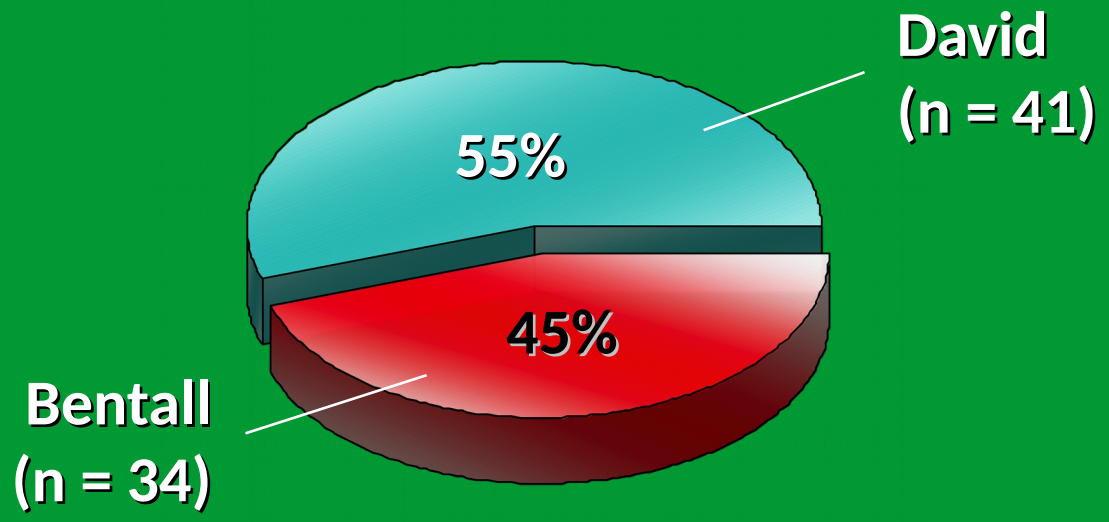
Nardi P et al, Ann Thorac Surg 2013

TOR VERGATA UNIVERSITY POLICLINIC

"Centro Regionale Sindrome di Marfan e MR"

AORTIC ROOT SURGERY IN MARFAN SYNDROME

(75 pts, 1992-11.2014)



THE MARFAN SYNDROME

Early Surgical Treatment

- *Aortic root Ø ≥ 45 mm*
- *Aortic ratio ≥ 1.3*
- *Increase of aortic root Ø > 1 cm /year*
- *Onset or progression of AR*

Objective: aortic valve sparing (David)

THE MARFAN SYNDROME

Bentall vs. David

Echographic characteristics	Bentall (n = 23)	David (n = 24)	*p*
Aortic regurgitation (x/4)	3.2 ± 1.1	1.7 ± 1.4	0.0004
Aortic annulus (mm)	33 ± 10	33 ± 5	NS
Aortic root (mm)	53 ± 9	45 ± 9	0.05
Ascending aorta (mm)	56 ± 5	44 ± 9	0.001
LVEF	0.52 ± 0.09	0.61 ± 0.06	0.003
LVESD (mm)	47 ± 13	38 ± 10	0.05
LVEDD (mm)	58 ± 11	52 ± 9	NS

THE MARFAN SYNDROME

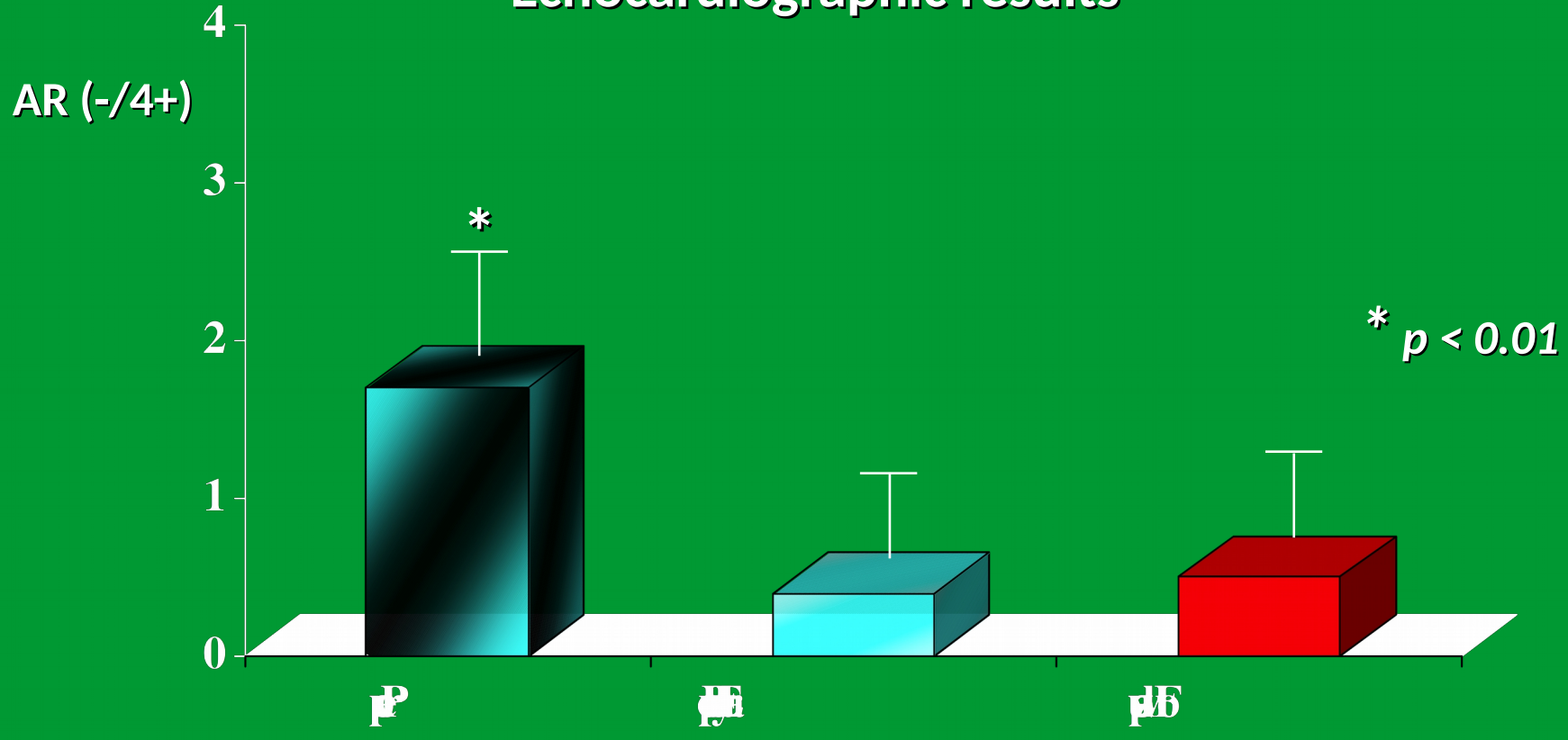
Bentall with mechanical prostheses vs. David Reimplantation

- No operative mortality
- No thromboembolism or major haemorrhage during follow-up
- 10-Year survival 91% vs. 100% *(p=NS)*
- 10-Year freedom from reoperation 100% vs. 91% *(p=NS)*

Nardi P et al, J Cardiovasc Med 2010

David Operation in Marfan Patients

Echocardiographic results



Aneurysms of Aortic Root and Ascending Aorta

Optimal surgical results with:

- Multiple technical options (traditional and innovative)
- Low operative risk *(3.5% in our 19-year experience)*

Bentall Operation

- In presence of more dilated aortic root, more severe AR, or diseased aortic valve, Bentall operation remains the optimal surgical strategy

VALVE-SPARING TECHNIQUES

Aortic valve

more and more frequently can be spared

(~40-50% in our recent experience)

with a stable follow-up function

VALVE-SPARING TECHNIQUES

Low-risk *(operative mortality ~1%)* **and effective for the treatment of aortic valve not primitively diseased in association with ascending aorta /aortic root replacement**

The Marfan Syndrome

Early surgical intervention:

↑ chances of aortic valve sparing

(David Reimplantation), aiming to avoid life-long anticoagulation therapy, and get pregnant

The Marfan Syndrome

- **David reimplantation seems to favor a stable aortic valve function at 10-year follow-up period and guarantees high freedom from death**
  (100% survival)