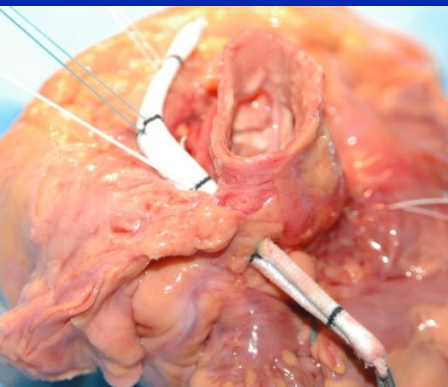


# The aorto-ventricular junction in aortic repair

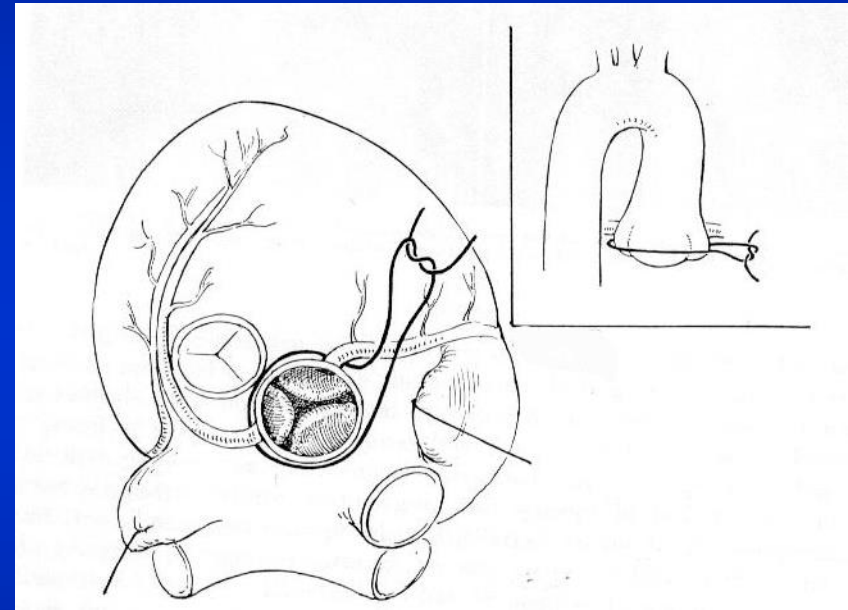
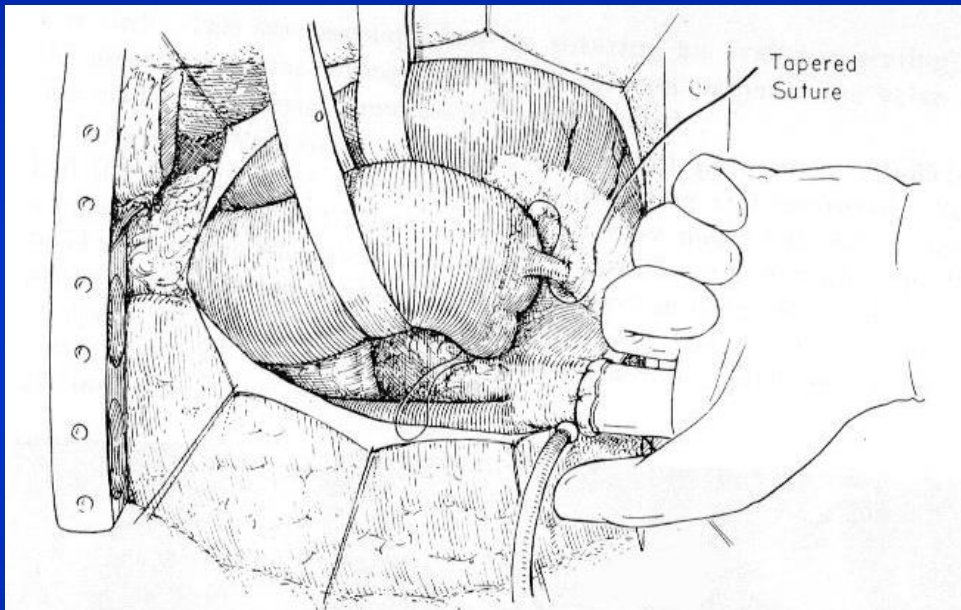
Emmanuel Lansac,  
Isabelle Di Centa

Cardiac Surgery  
Institut Mutualiste Montsouris,  
Paris, France



# The surgical correction of aortic insufficiency by circumclulsion

Taylor WJ, et al. JTCVS 1958;35:192-231



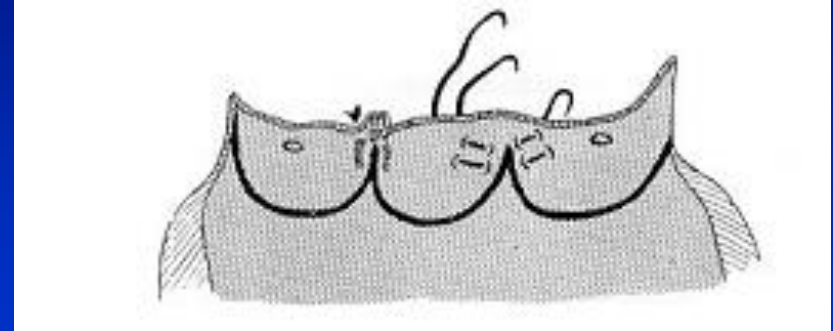
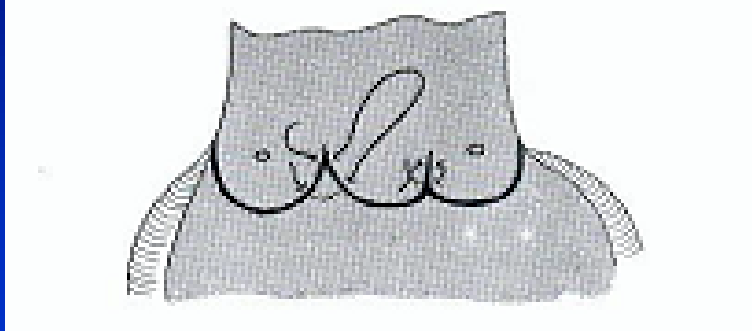
**First subvalvular aortic annuloplasty**

Beating Heart Right thoracotomy

11 patients, rheumatic disease (8/11)

# Subcommissural plication stitches

(Cabrol stitches 1966)



Plicating U stitches at the base  
of the interleaflet triangles

Plicating U stitches at the  
commissures

= partial subvalvular annuloplasty

= partial supra-annular annuloplasty

Plication of the interleaflet triangles impairing valve dynamics  
especially for bicuspid valves  $\Rightarrow$  significant gradient  
minimal reduction in aortic annular base diameter

Useful to protect a commissural repair or as a bailout  
technique

# 2014 ESC Guidelines on the diagnosis And treatment of aortic diseases

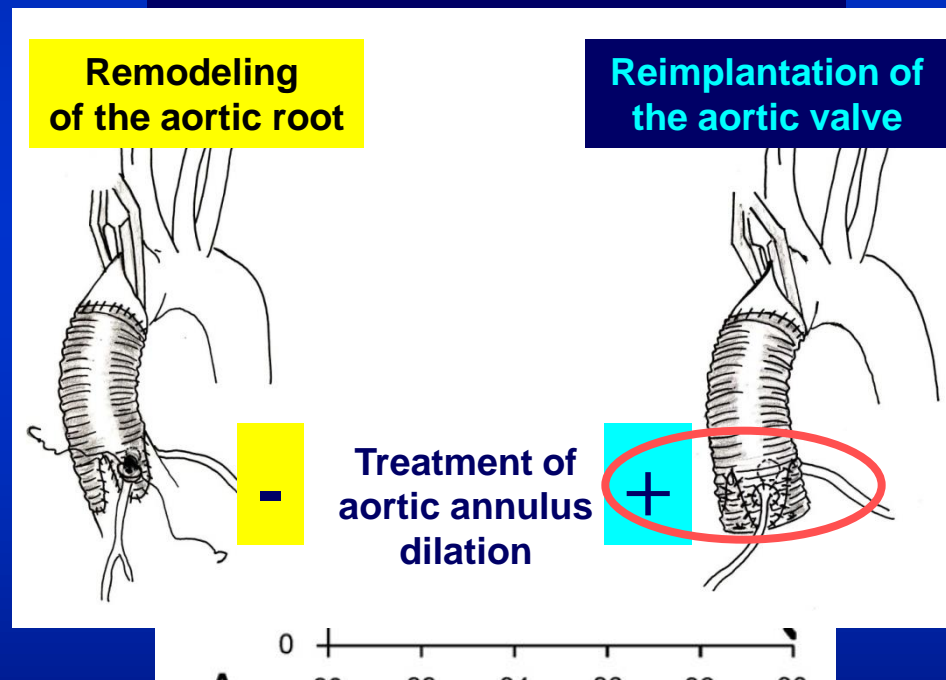
Aortic valve repair, using the re-implantation technique or remodelling with aortic annuloplasty, is recommended in young patients with aortic root dilation and tricuspid aortic valves.

I

C

# Aortic annuloplasty and valve sparing root replacement ?

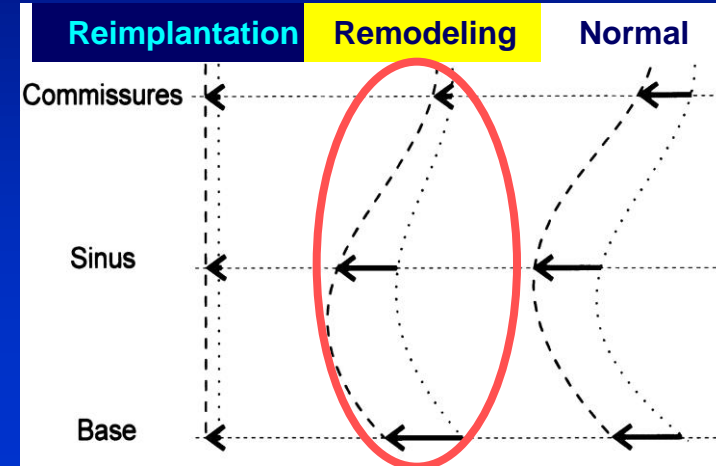
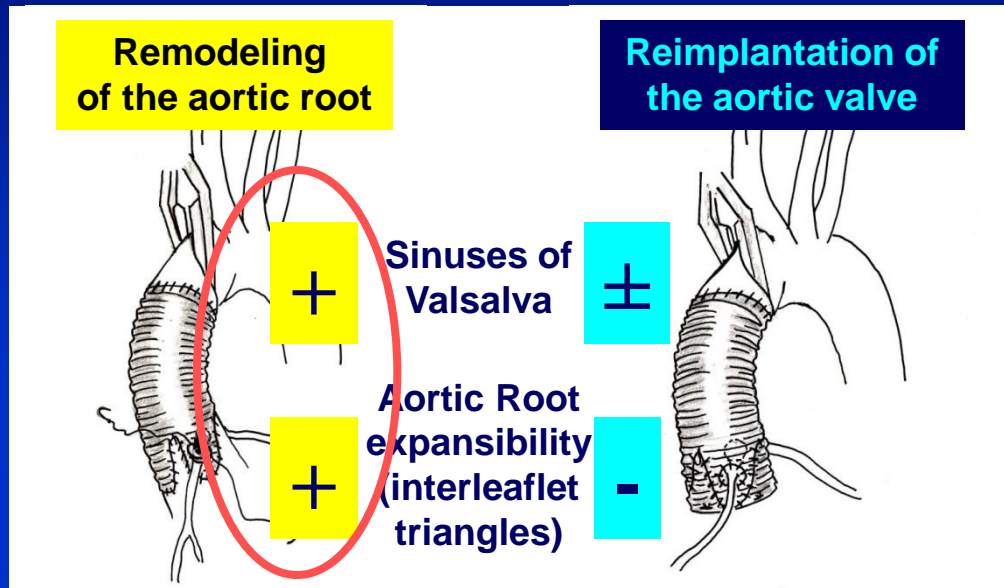
**Risk factor for failure of the Remodeling :  
Annulus dilation >25-28 mm**



**Reimplantation performs a subvalvular annuloplasty**

**Remodeling alone is a contraindication if annulus >25 mm**

# Aortic root dynamics after valve sparing



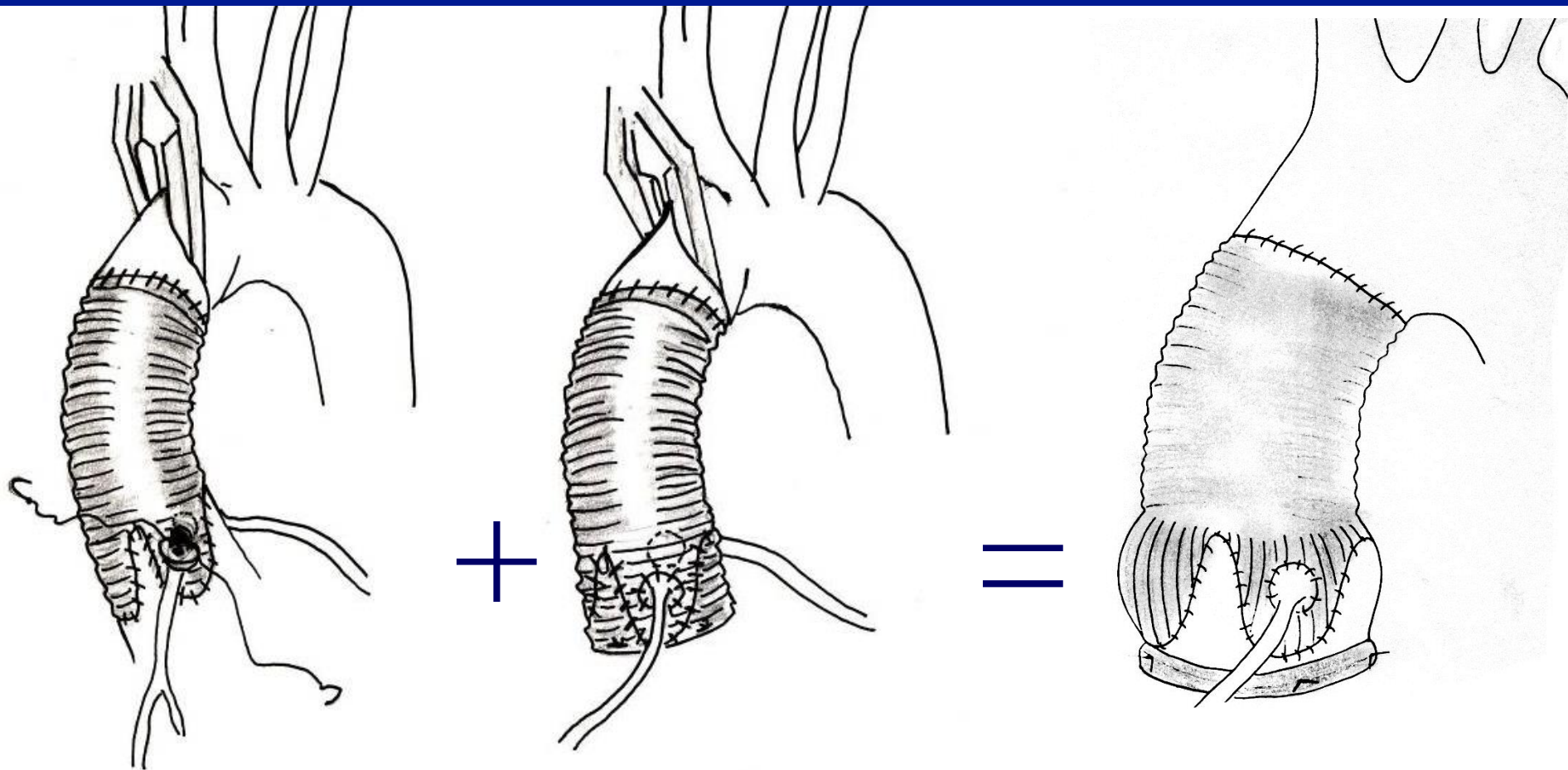
Leyh RG. Circulation 1999

**Cusp motion and expansibility of the aortic root are best preserved**

- 1) after Remodeling than after Reimplantation
- 2) with graft with neo- sinuses of Valsalva than without

**Remodeling provides the most physiological root reconstruction**

# Physiological and standardized approach to Valve Sparing Root Replacement



**Remodeling  
1983 Yacoub**

**Reimplantation  
1992 David**

**Remodeling +  
Aortic annuloplasty  
2003**

# Reasons for valve sparing failures

## Cusp prolapse

Remodeling /  
Reimplantation

Reduction  
of the STJ

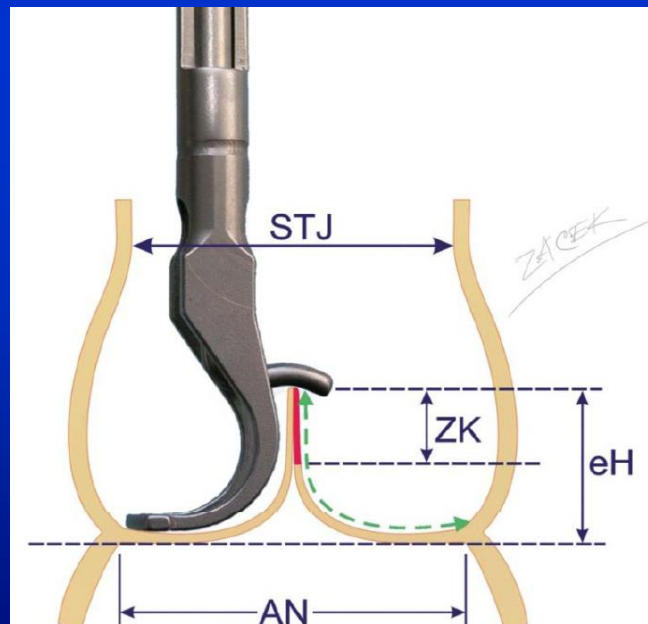
Symmetrical  
prolapse

↓ eH : - 3 to - 4 mm

No eH resuspension  
(Eye balling repair)

Risk factor for  
AI recurrence  
Reoperation

Lansac JTCVS 2010



Schäfers et al., JTCVS 2006

Soncini. MEP 2009

Bierbach E JTCVS 2010

Jeanmart ATS 2007

De Paulis 2010

Oka ATS 2011

Kunihara JTCVS 2011

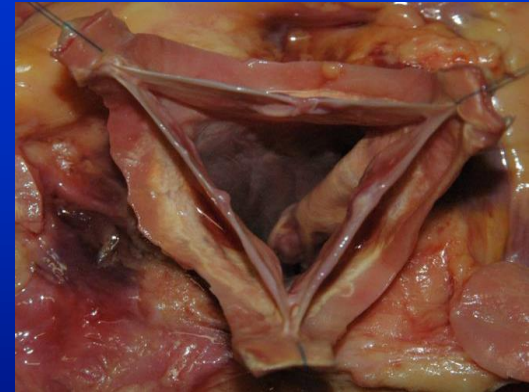
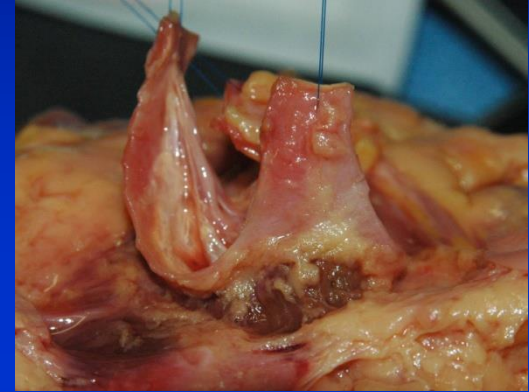
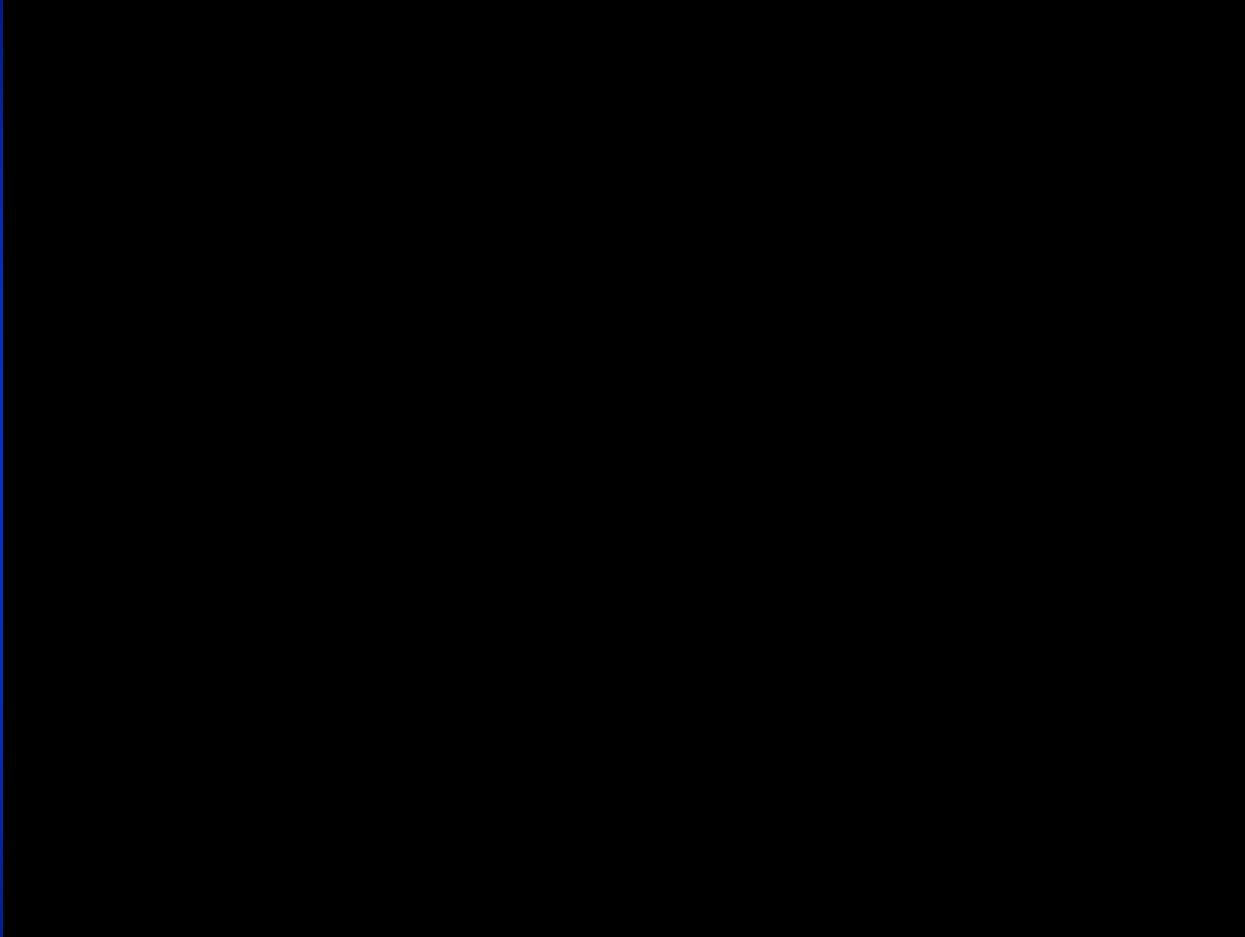
Cusp eH resuspension

Marom JTCVS 2012


Zacek with permission



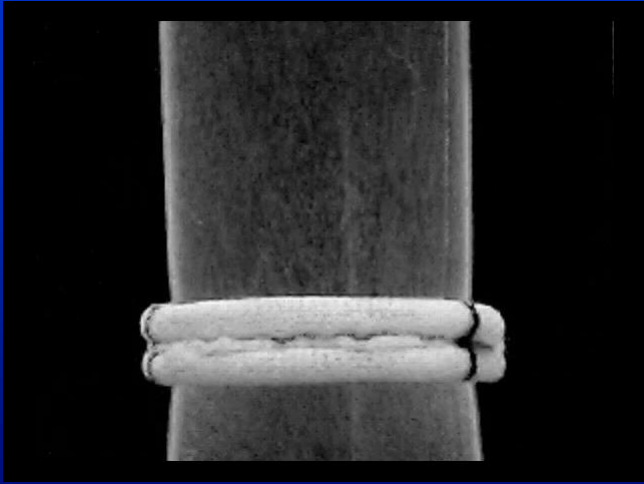
# 1. Dissection of the subvalvular plane



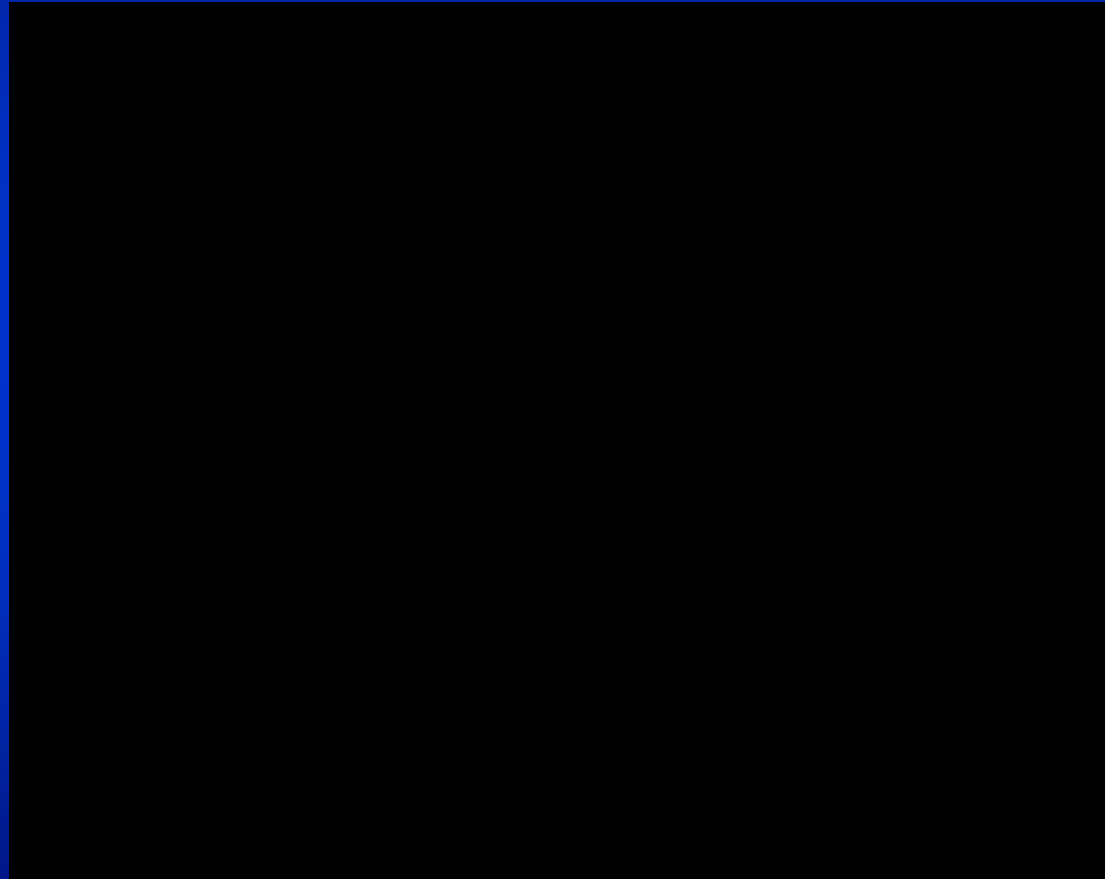
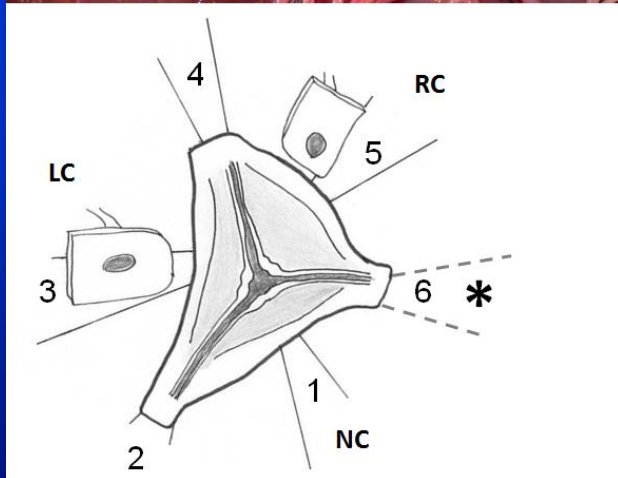
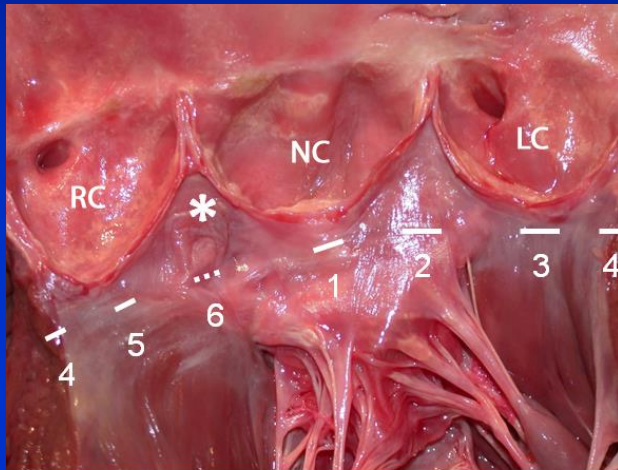
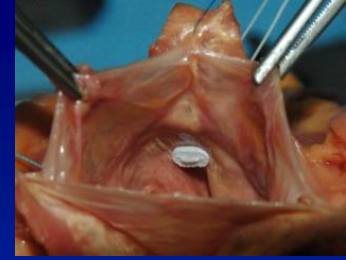
# Standardization based on aortic annulus Ø

 	Aortic annular base Ø (Hegar dilators, mm)				
	25-27	28-30	31-35	36-40	> 40
Valsalva graft® Ø (mm)	26	28	30	32	34
Extra aortic ring® Ø (mm)	25	27	29	31	33

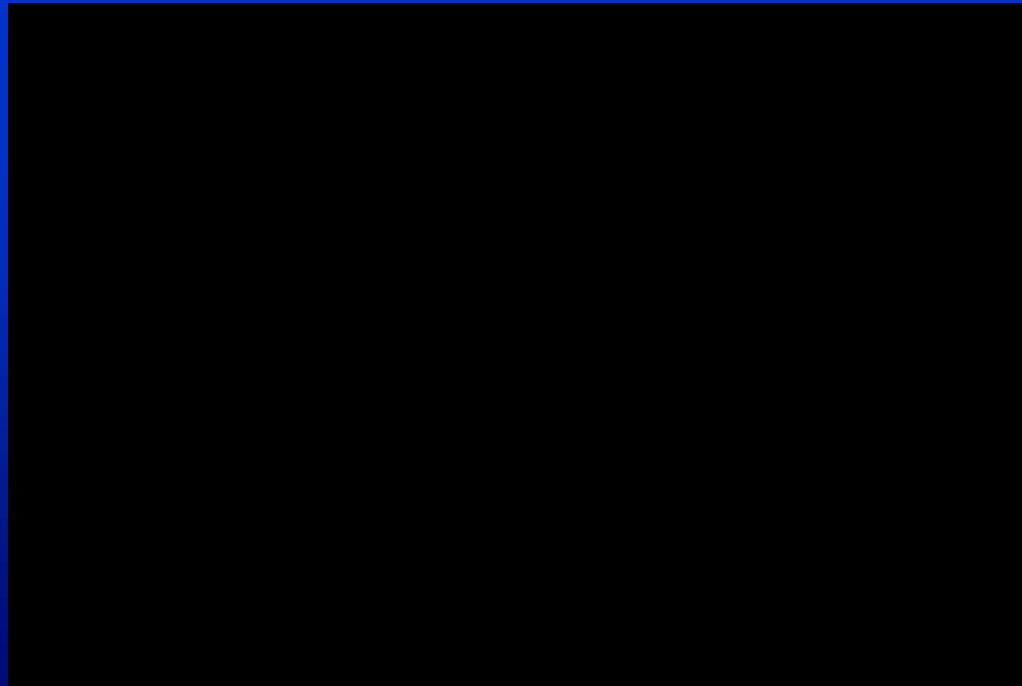
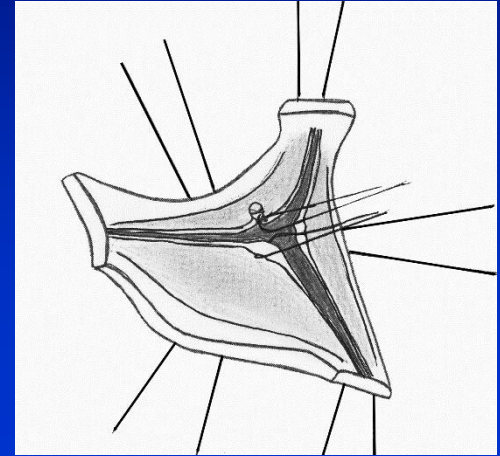
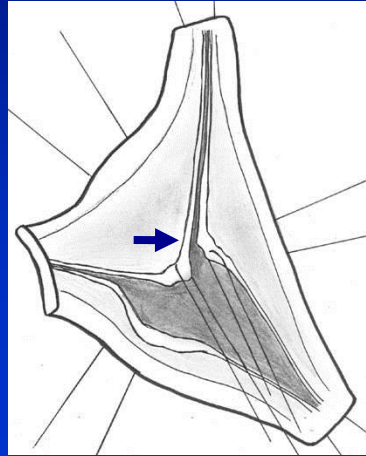
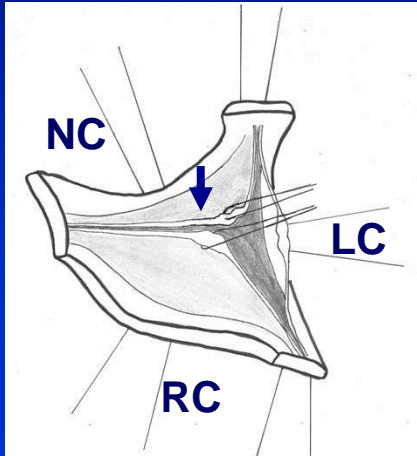
**Annuloplasty ring = down size from one size**



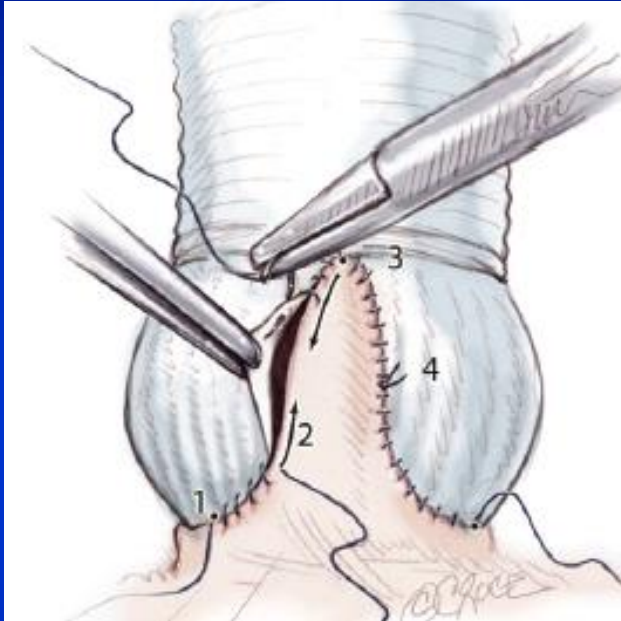
# 6 subvalvular « U » stitches



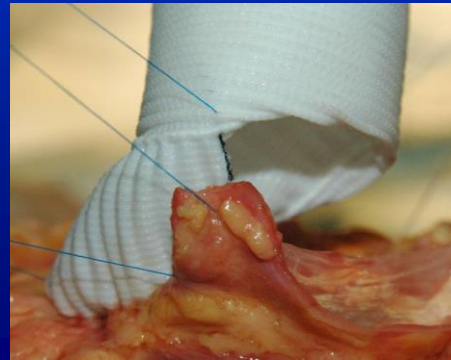
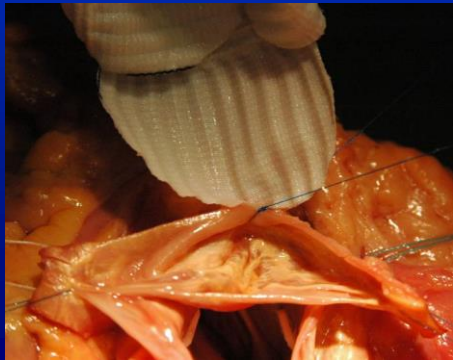
# Alignment of cusp free edges prior Remodeling



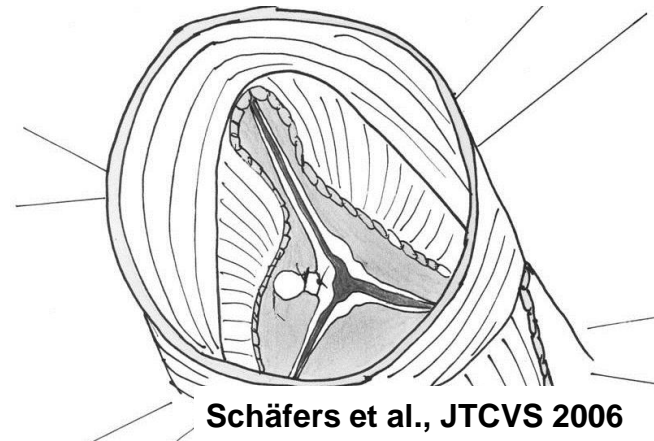
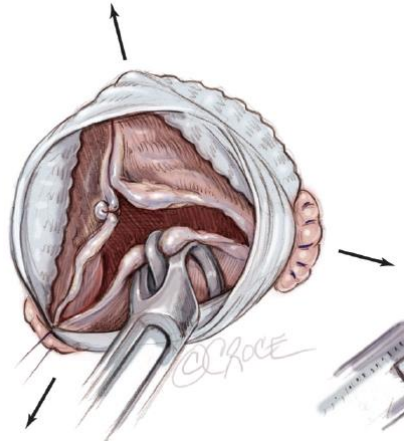
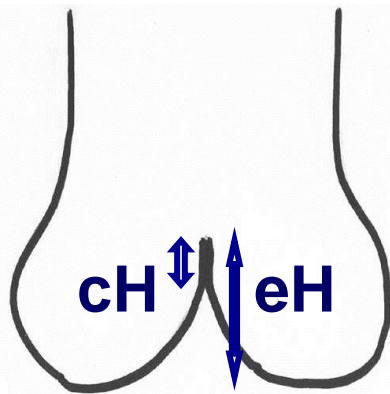
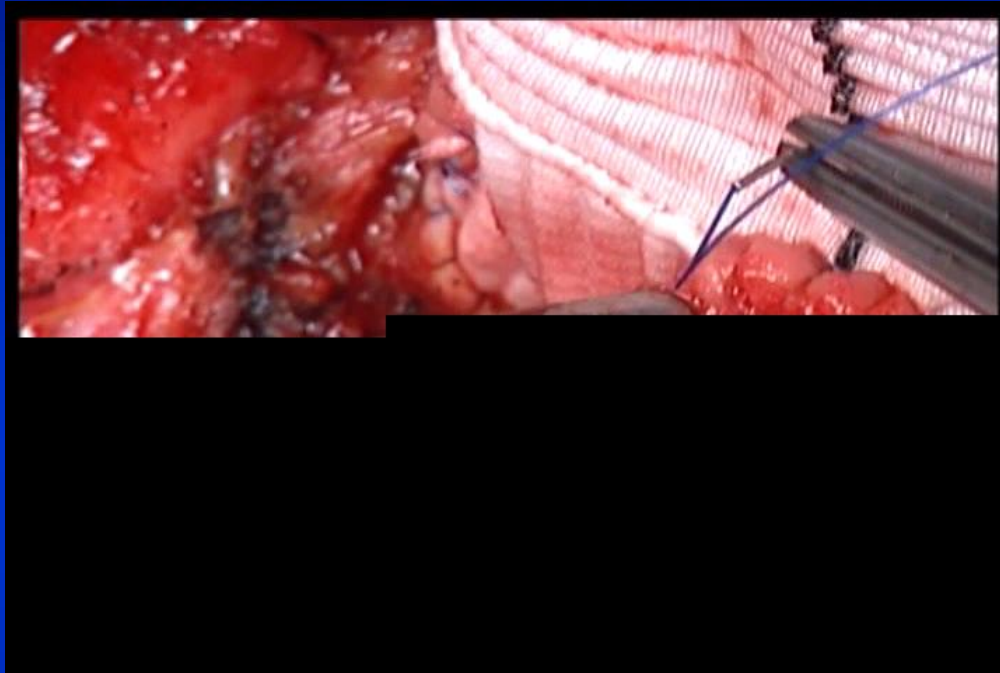
# Remodeling Root repair



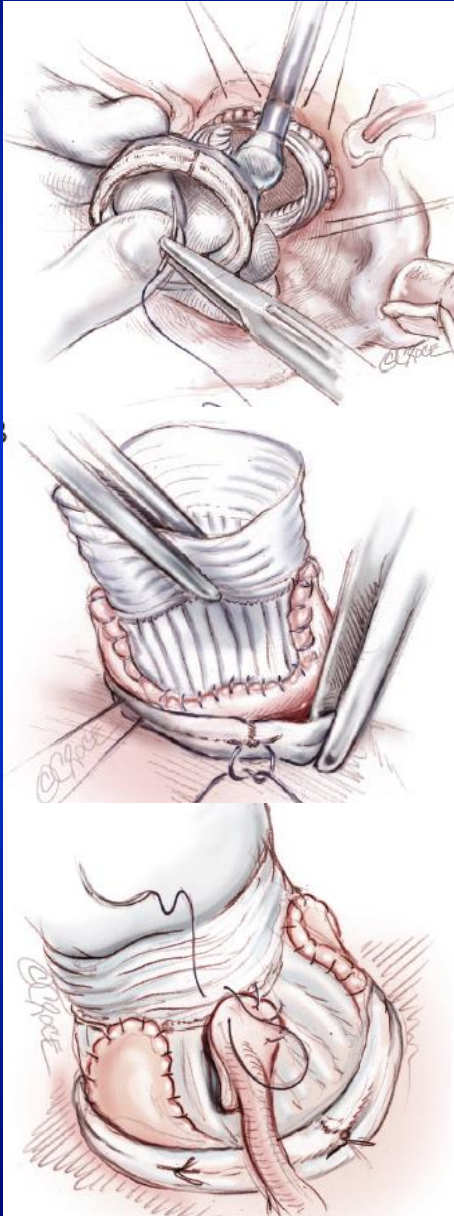
**3 commissures at same level**  
**Symmetrically at 120°**



# Cusp resuspension after the Remodeling (effective height 9 mm)



# Subvalvular ring implantation

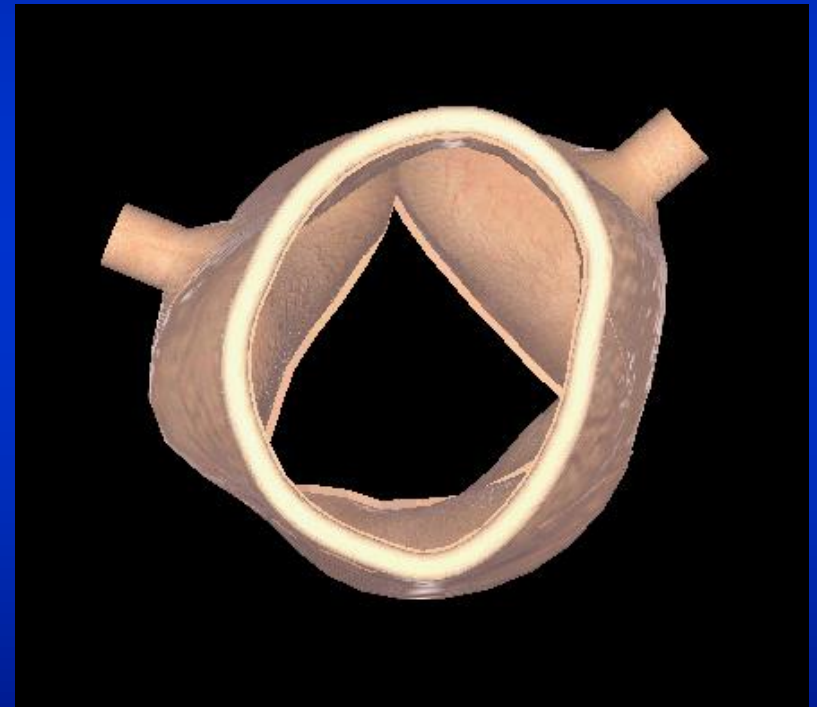


# Pre and Post Remodeling with expansible Extra Aortic Ring Annuloplasty

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Pre-op



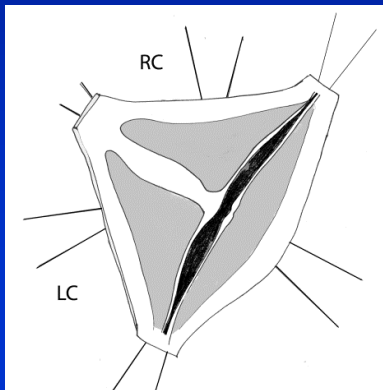
Post-op



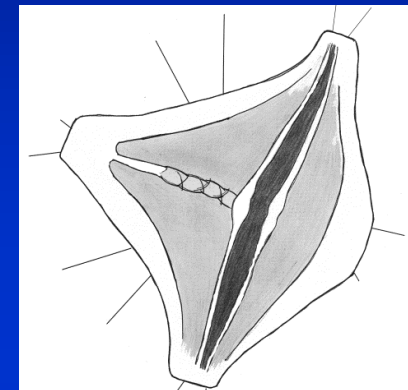
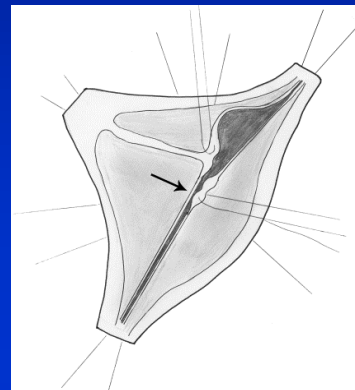
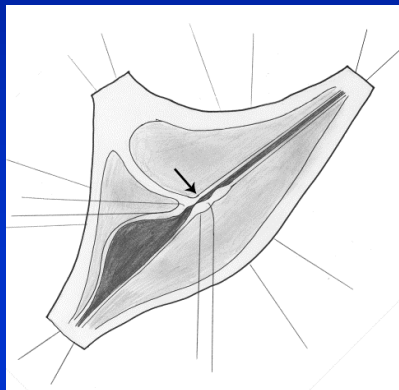
# Root aneurysms: Bicuspid valves

(Sinus Valsalva  $\text{\O} \geq 45 \text{ mm}$ )

6 subvalvular  
« U » stitches



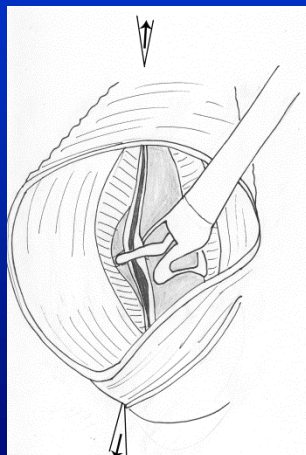
Alignment of cusp free edges



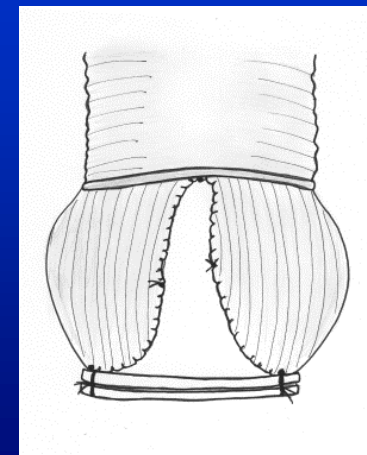
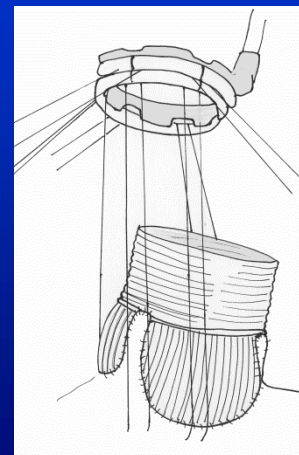
Commissures  
at 180°



Effective height  
measurement



Subvalvular aortic annuloplasty



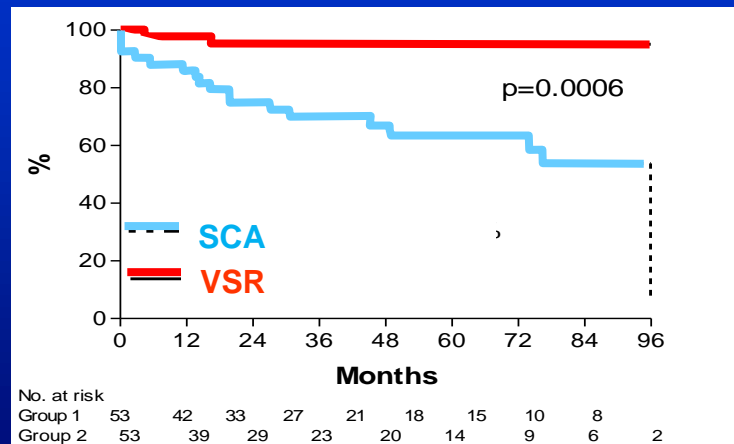
# Dilated aortic annulus > 25 - 28 mm

**Risk factor for failure**

Luciani ATS 1999, Lansac EJTCVS 2006, Hanke JTCVS 2008, de Kerchove JTCVS 2010, Schäfers JTCVS 2013, Navarra EJTCVS 2013, Aicher JTCVS 2013, Vallabhajosyula ATS 2014, Fattouch ICVTS 2014, De Kerchove EJTCVS 2016

## Circumferential aortic annuloplasty improves the results

(External ring, proximal suture reimplantation, Annular stitch)

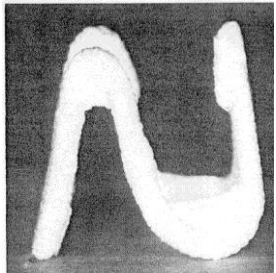


**Root for all ?**

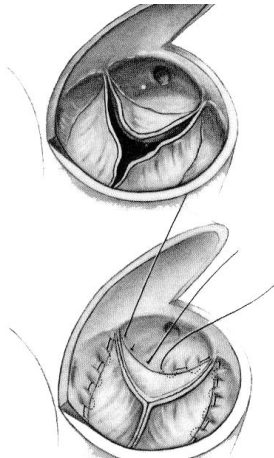
De Kerchove JTCVS 2011

# Techniques for aortic annuloplasty

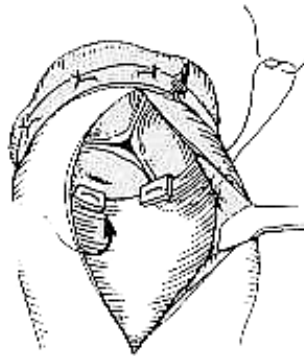
## Isolated AI



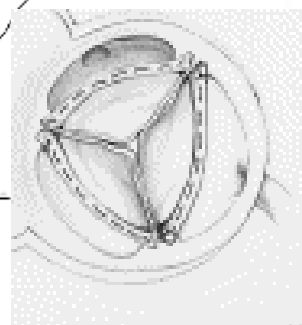
**Duran**  
1983



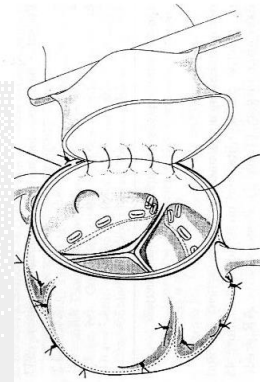
**Carpentier**  
1983



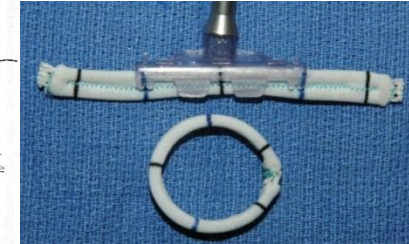
**Frater**  
1986



**Haydar**  
1997



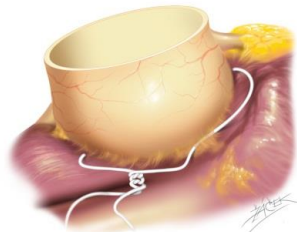
**Izumoto**  
2002



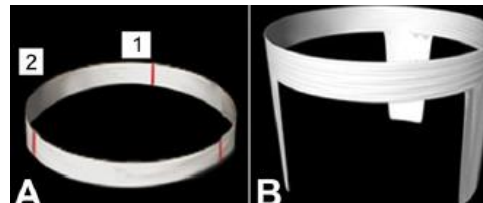
**Lansac**  
2003



**Hahm**  
2006



**Schäfers**  
2009



**Fattouch**  
2011



**Scharfschwerdt**  
2011



**Rankin**  
2011

**Need for standardization**

# Internal annuloplasty ring

## Tricuspid valve

65 patients with 62 % root aneurysm.

10.8% reoperation rate (7 patients) at 2 years FU

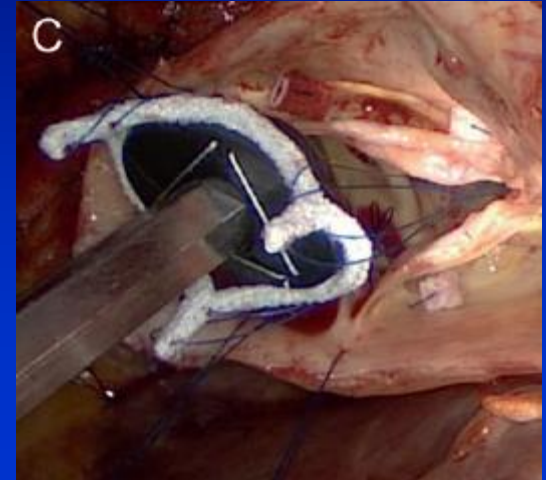
**Advantage : place at the nadir**

## Bicuspid valve

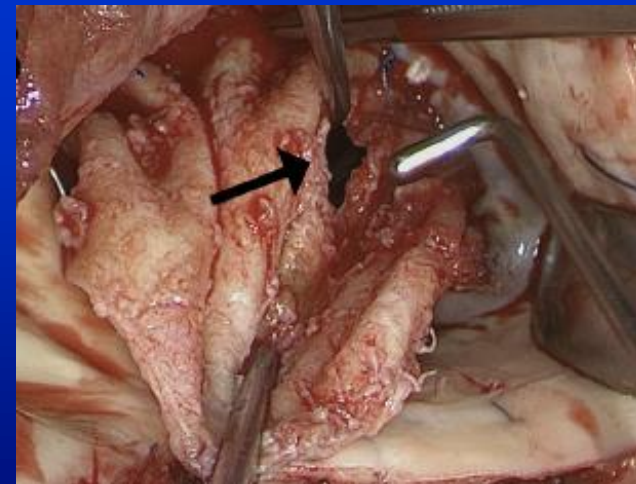
16 patients (43 % with ascending/root aneurysm)

12.5 % reoperation (2 patients) : leaflets tear from annular suture (Mean FU 9 months)

**Drawbacks : interference with leaflets  
Tension on the suture (internal device)**



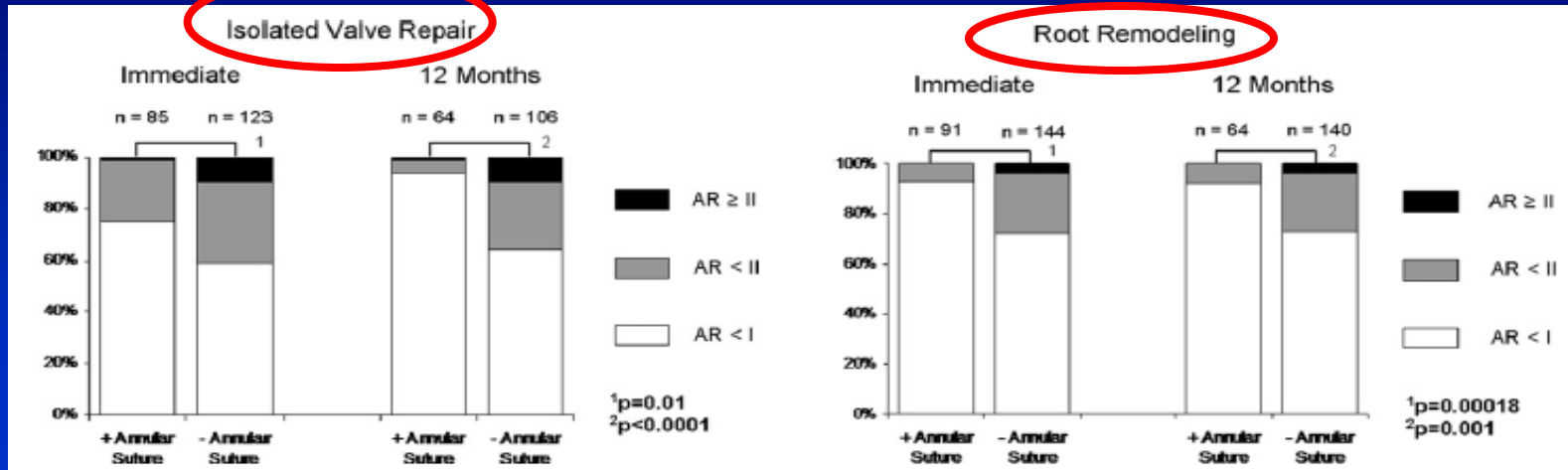
Mazzitelli EJCTS 2016



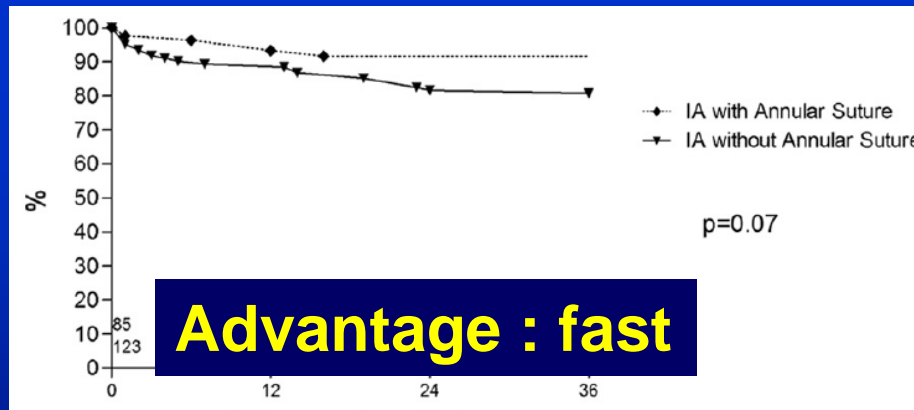
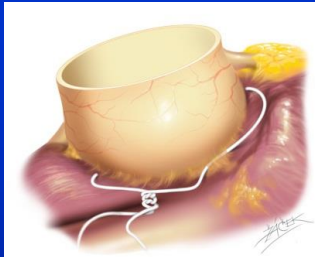
Mazzitelli ATS 2015

# Early results with annular support in reconstruction of the bicuspid aortic valve

Aicher JTCVS 2013

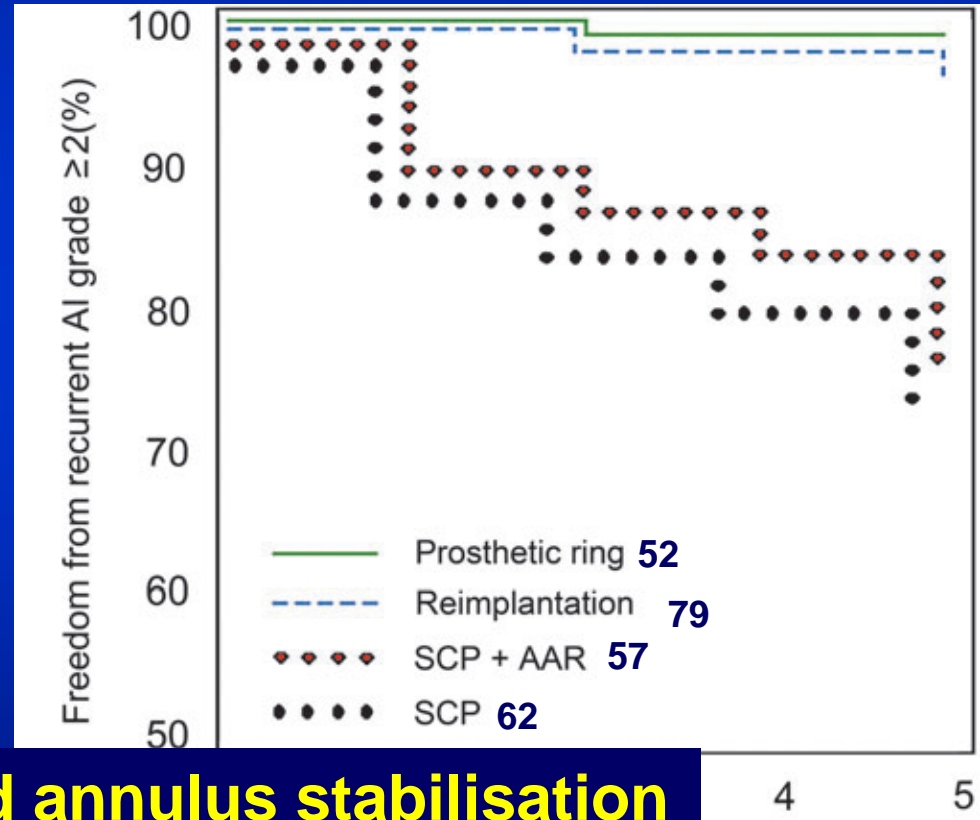
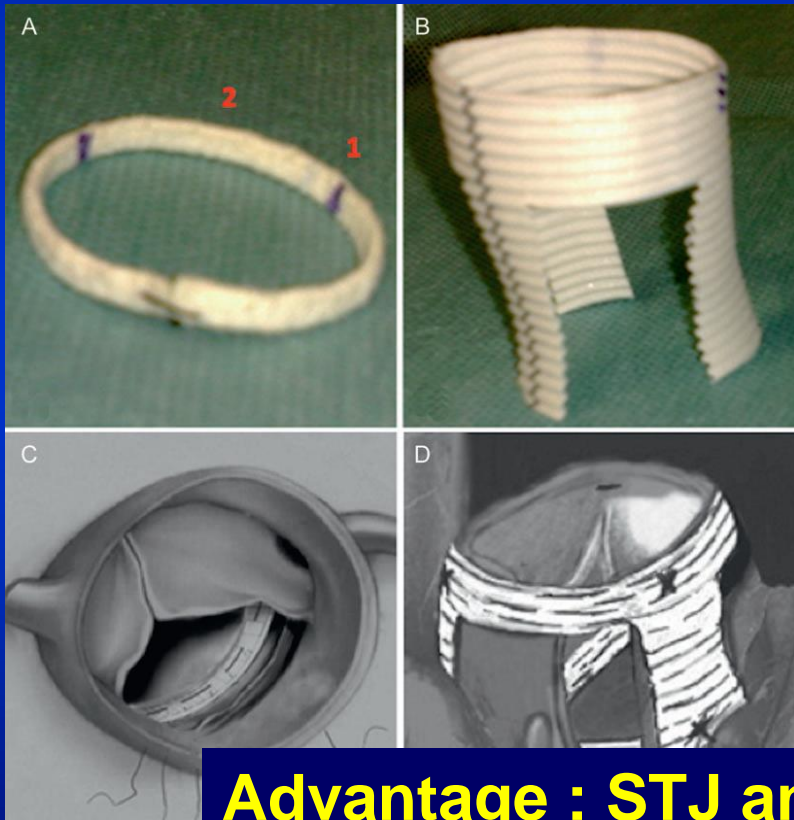


Annuloplasty improve rate of no or trivial AR



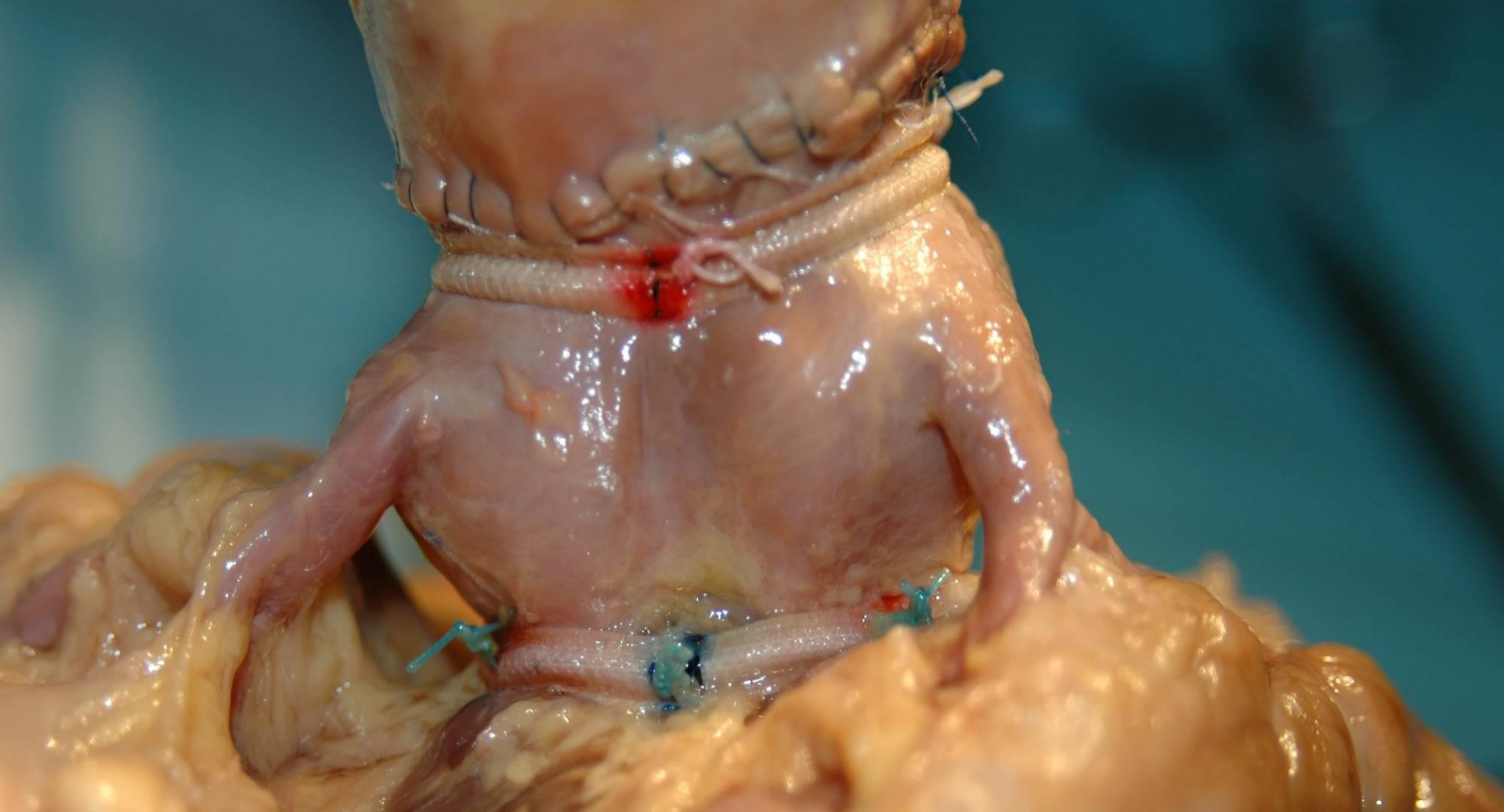
**Drawbacks : anatomical landmarks?  
Safety and long term stability?**

# Functional annulus remodelling using a prosthetic ring in tricuspid aortic valve repair: mid-term results



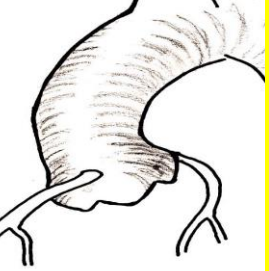
**Advantage : STJ and annulus stabilisation**

**Drawbacks : interference with leaflets,  
Tension on the suture (internal annuloplasty ring)**



**Advantage : safe with clear anatomical landmarks**

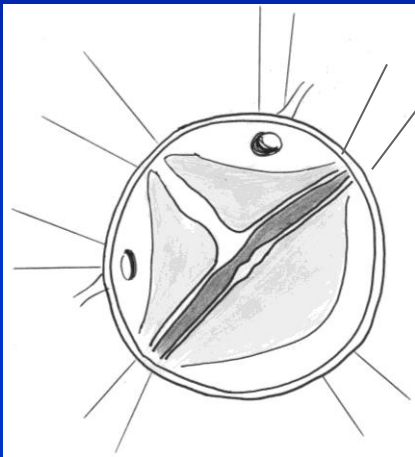
**Drawbacks : Right coronary sinus nadir (reimplantation limit)  
Importance of deep dissection of sub valvular plane**



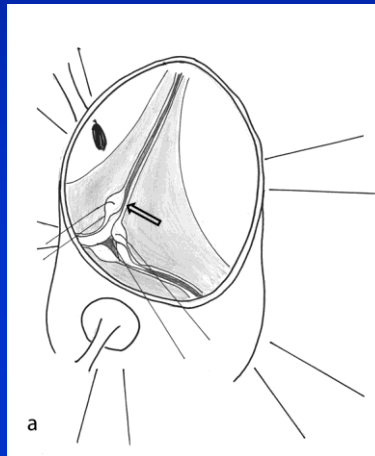
# Double annuloplasty For Isolated aortic valve repair (all diameters $\leq 40$ mm)



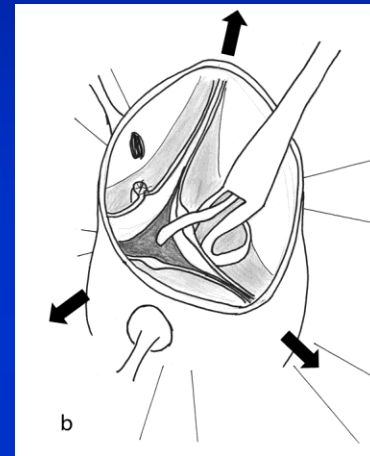
6 subvalvular « U »  
stitches



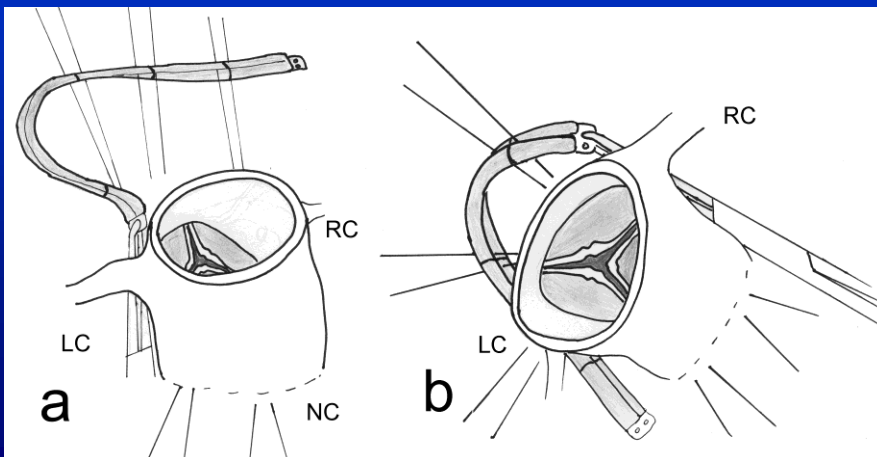
Alignment of cusp free edges



Cusp resuspension  
(effective height  $\geq 9$  mm)



Placement of the open subvalvular ring  
below the coronaries



Final aspect





# Standardization based on aortic annulus Ø

	Aortic annular base Ø (Hegar dilators, mm)				
	25-27	28-30	31-35	36-40	> 40
STJ ring Ø (mm)	25	27	29	31	33
Extra aortic ring® Ø (mm)	25	27	29	31	33

**Aortic ring = down size from one size**



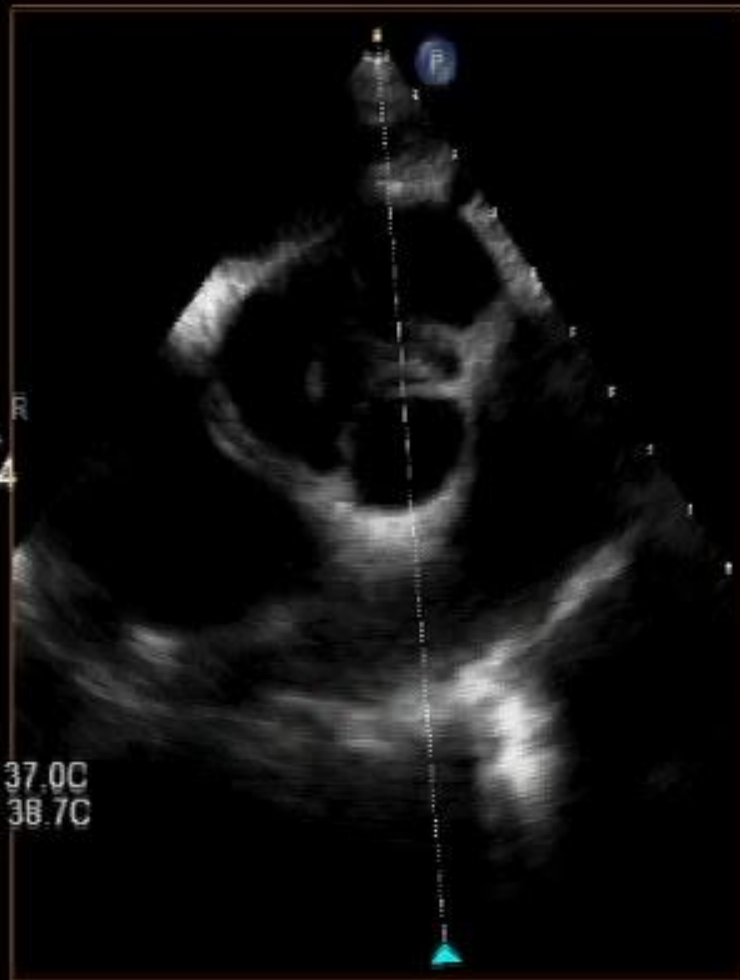
21/09/2015 09:16:22

TISO.3 MI 0.5

HR : 71  
X7-2t  
58Hz  
12cm

M4

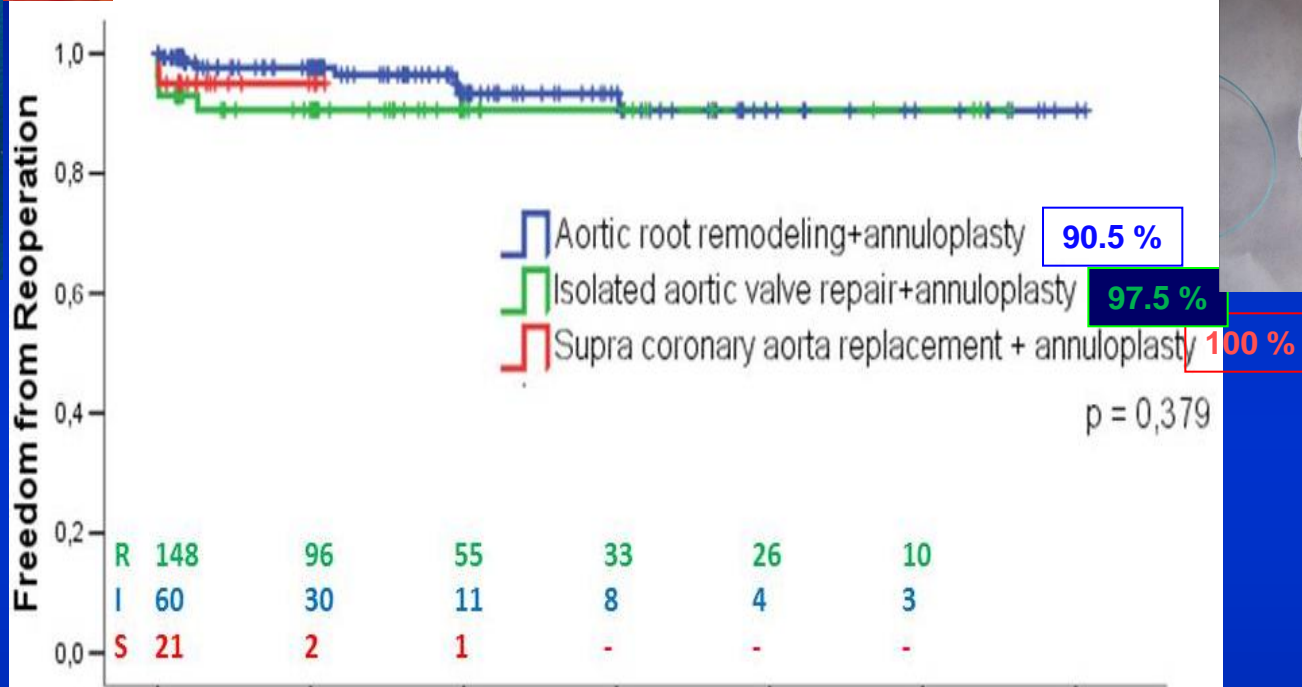
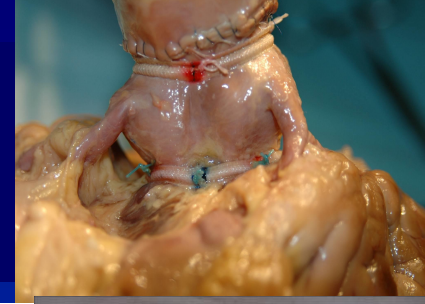
xPlane  
52%  
52%  
50dB  
P Arrêt  
HGén



PAT T: 37.0C  
TEE T: 38.7C

71 bpm

# External annuloplasty ring 232 patients (2003 -2015)



**92% Freedom from reoperation at 7 years similar among each phenotype with no difference between bicuspid and tricuspid valve**

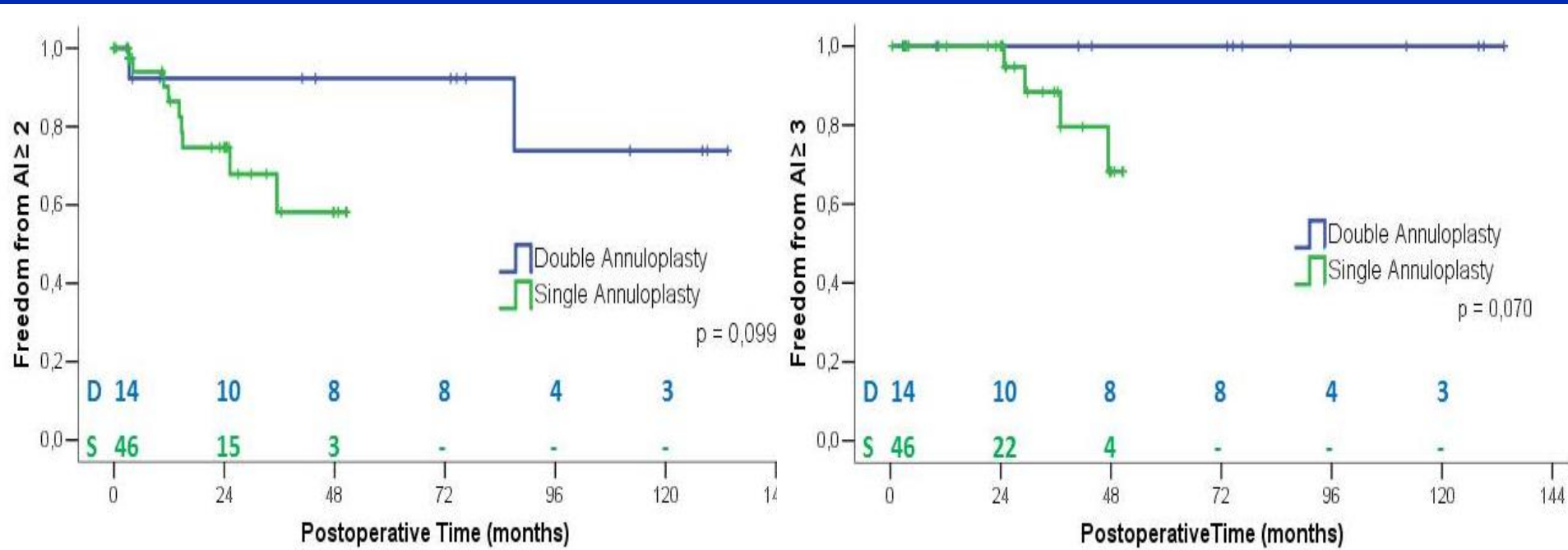
**Since 2007, calibrated annuloplasty and systematic cusp effective height assessment improve freedom from reoperation up to 98.9%**



# Isolated AI repair+open aortic ring Single or double annuloplasty?

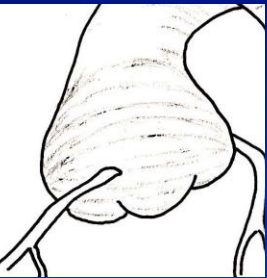


97.4 % Freedom from reoperation at 7 years



**Additional ring at STJ level (double sub and supra-valvular annuloplasty)  
tend to reduce recurrent of AI  
when compared to single subvalvular annuloplasty**

# Pliable bicuspid and tricuspid valves



**Aortic root aneurysm**

Valsalva  $\geq 45$  mm



**Supra-coronary aneurysm**

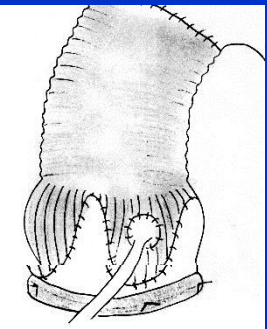
Valsalva  $< 40$  mm



**Isolated AI**

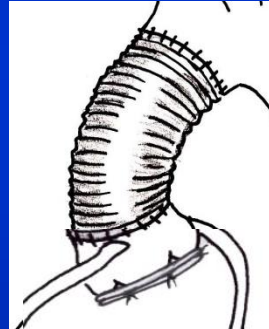
all  $\emptyset < 40$  mm

## Standardized approach according to phenotypes



**Remodeling**

+ aortic annuloplasty



**Supra-coronary graft**

+ aortic annuloplasty  
(annulus  $> 25$  mm)



STJ annuloplasty

aortic annuloplasty  
(annulus  $> 25$  mm)

**Cusp repair**

**First EACTS Aortic valve repair master class**

**Paris March 22-24th 2017**

**(live surgery)**

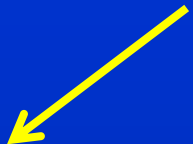


# Open Prospective International Multicenter Registry

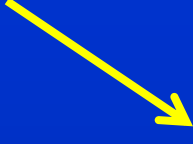
**Isolated AI and/or ascending aorta aneurysm  
Candidates for Aortic valve repair / sparing**

## Surgical indication

No



Yes



**Medical Registry**  
(In process)

**Surgical Registry**  
Aortic valve Repair / sparing and Replacement

**Evaluation of the Guidelines**

**Evaluation of the results**



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