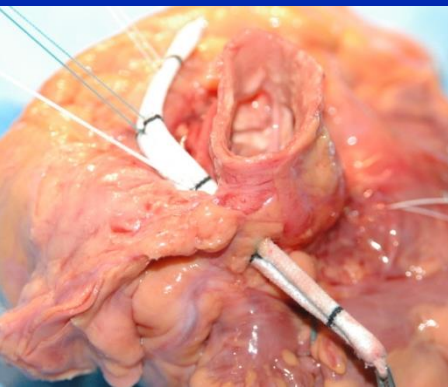


# The aorto-ventricular junction in aortic repair

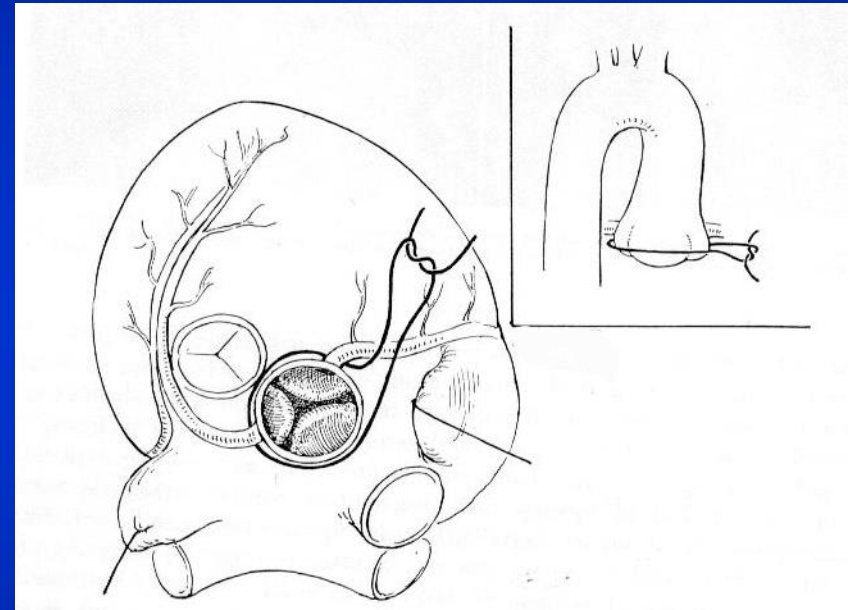
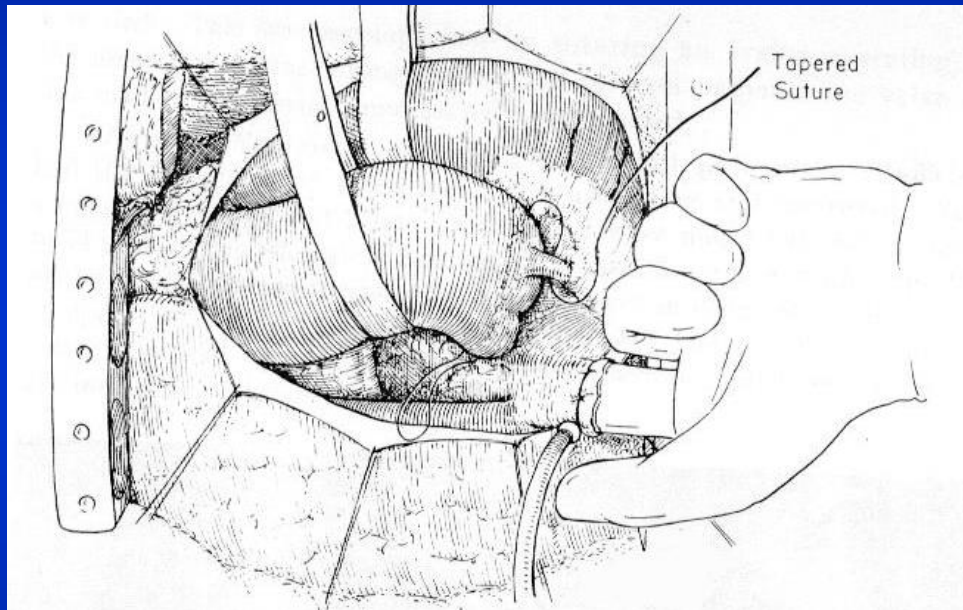
Emmanuel Lansac,  
Isabelle Di Centa

Cardiac Surgery  
Institut Mutualiste Montsouris,  
Paris, France



# The surgical correction of aortic insufficiency by circumclulsion

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

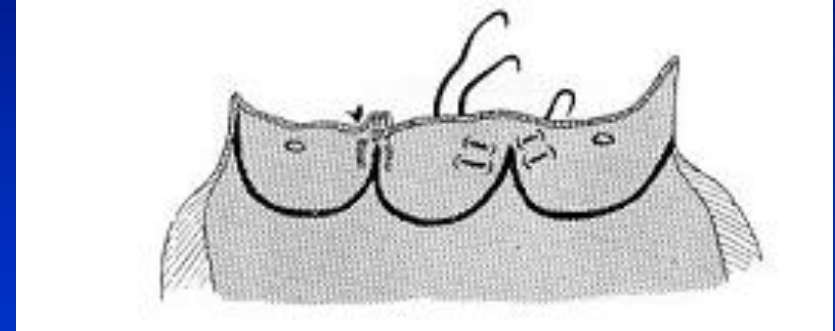
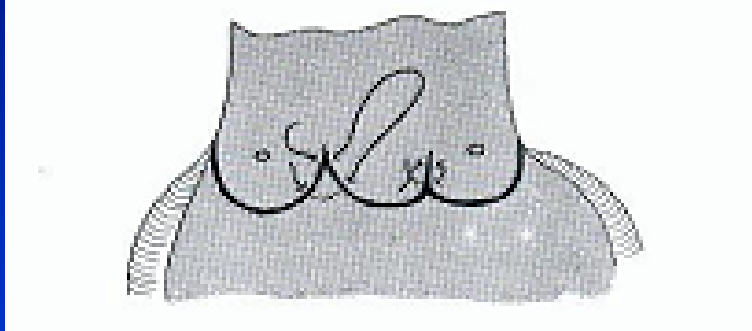


**First subvalvular aortic annuloplasty**

Beating Heart Right thoracotomy

11 patients, rheumatic disease (8/11)

# Subcommissural plication stitches (Cabrol stitches)



Plicating U stitches at the base  
of the interleaflet triangles

Plicating U stitches at the  
commissures

= partial subvalvular annuloplasty

= partial supra-annular annuloplasty

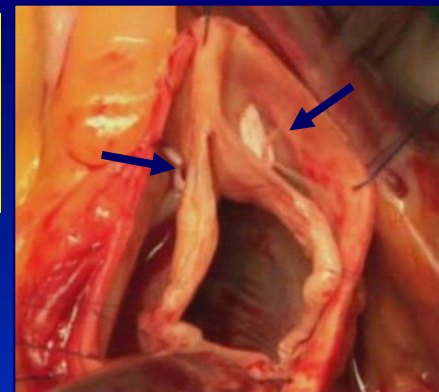
Plication of the interleaflet triangles impairing valve dynamics  
especially for bicuspid valves  $\Rightarrow$  significant gradient  
minimal reduction in aortic annular base diameter

Useful to protect a commissural repair or as a bailout technique

# Subcommissural plication stitches

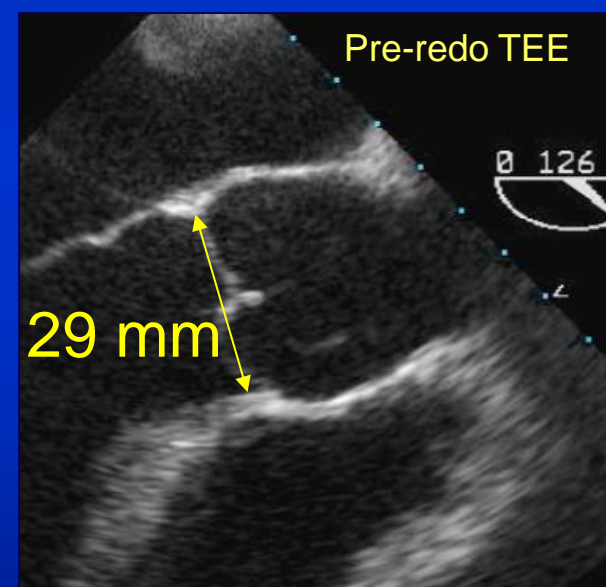
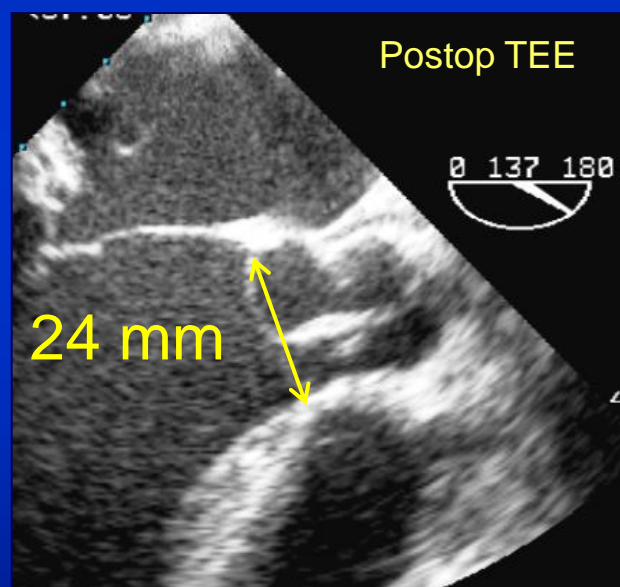
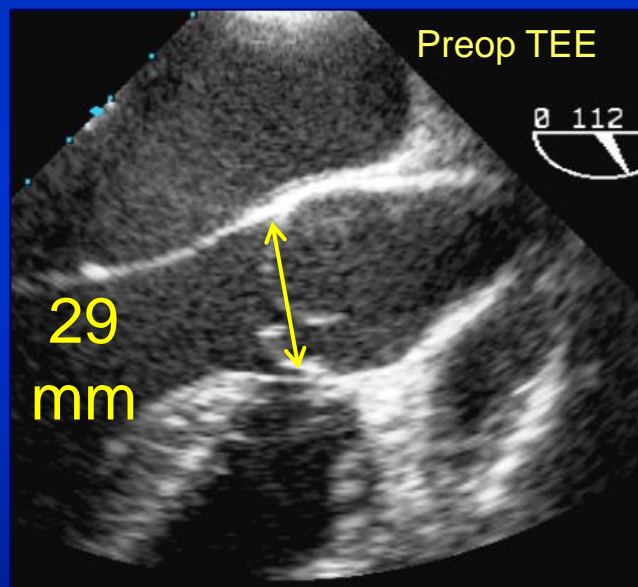
(Cabrol stitches-1966)

## Risk factor of BAV and TAV repair failure



BAV repair + SCA

→ at 6 y AR 3+

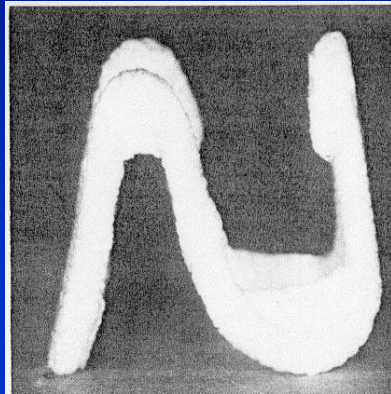


**Useful to protect a commissural repair or as a bailout technique**

# Aortic annuloplasty devices

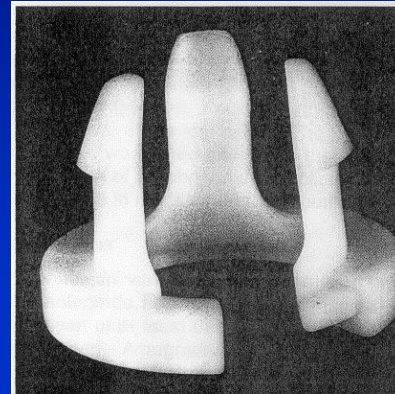
## Experimental

In vivo  
(18 sheep)

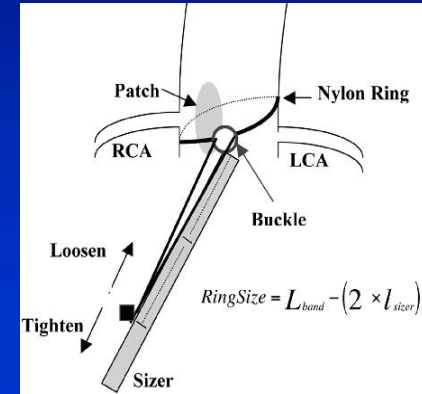


Calves  
roots

In vivo  
(4 calves)



In vivo  
(5 sheep)

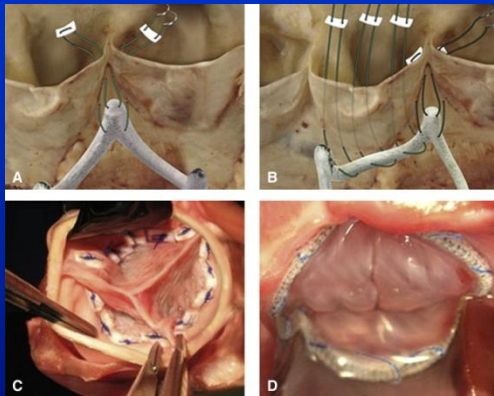


Duran 1993  
Internal ring

Reimold 1994  
External ring

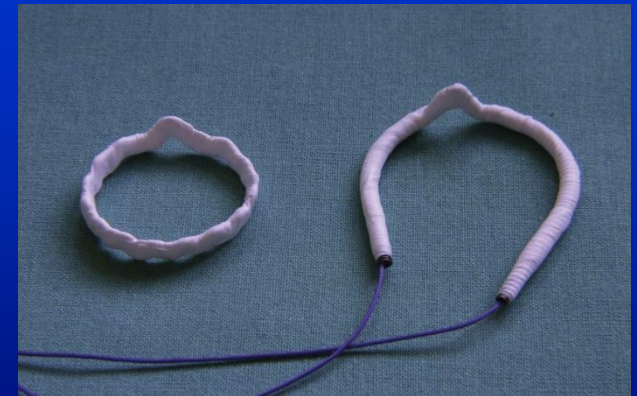
Gogbashian 2007  
External band

Porcine  
roots



6 months  
in vivo (1 calf)

Porcine  
roots

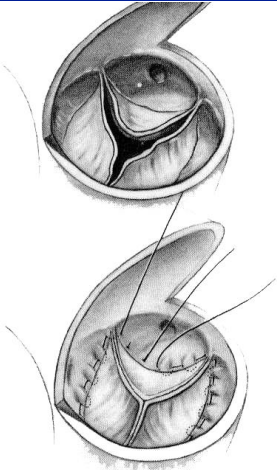


Rankin 2011  
Internal ring

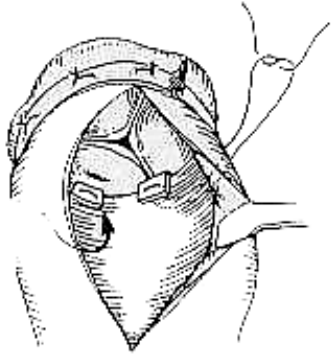
Scharfschwerdt 2011  
Internal or external ring

# Techniques for aortic annuloplasty

## Isolated AI



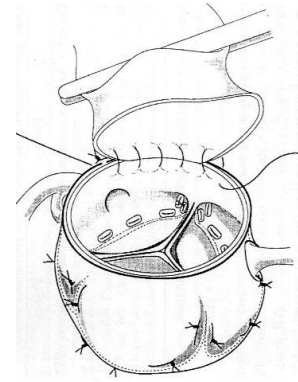
**Carpentier  
1983**



**Frater  
1986**



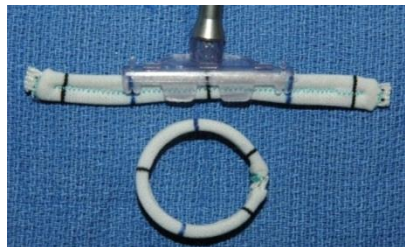
**Haydar  
1997**



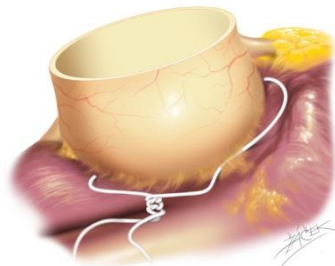
**Izumoto  
2002**



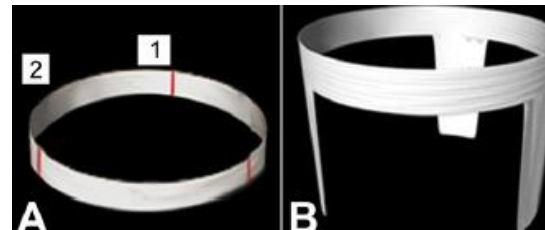
**Hahm  
2006**



**Lansac  
2003**



**Schäfers  
2009**



**Fattouch  
2011**

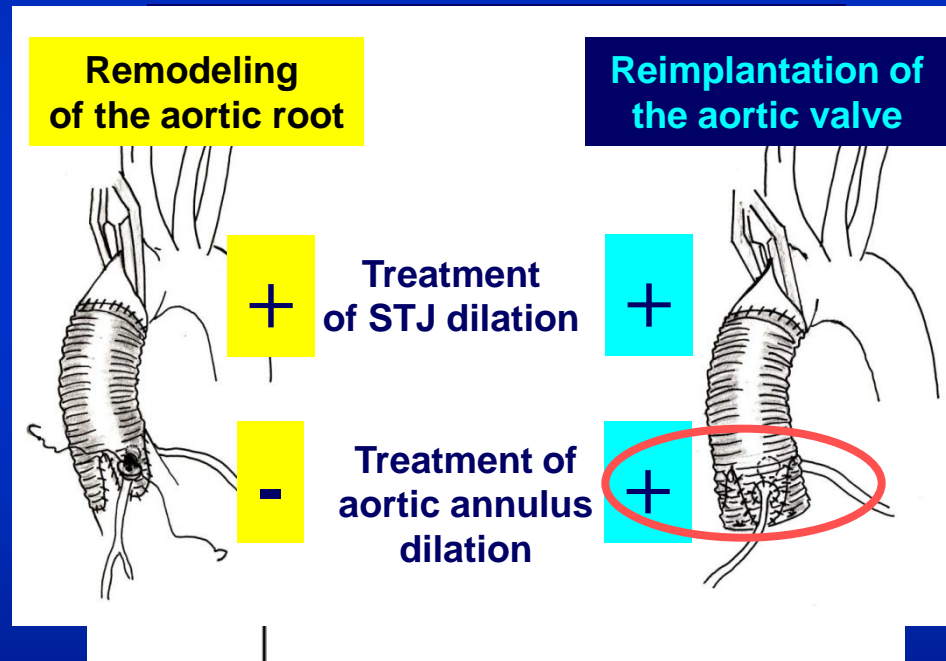


**Rankin  
2011**

**Need for standardization**

# Aortic annuloplasty and valve sparing root replacement ?

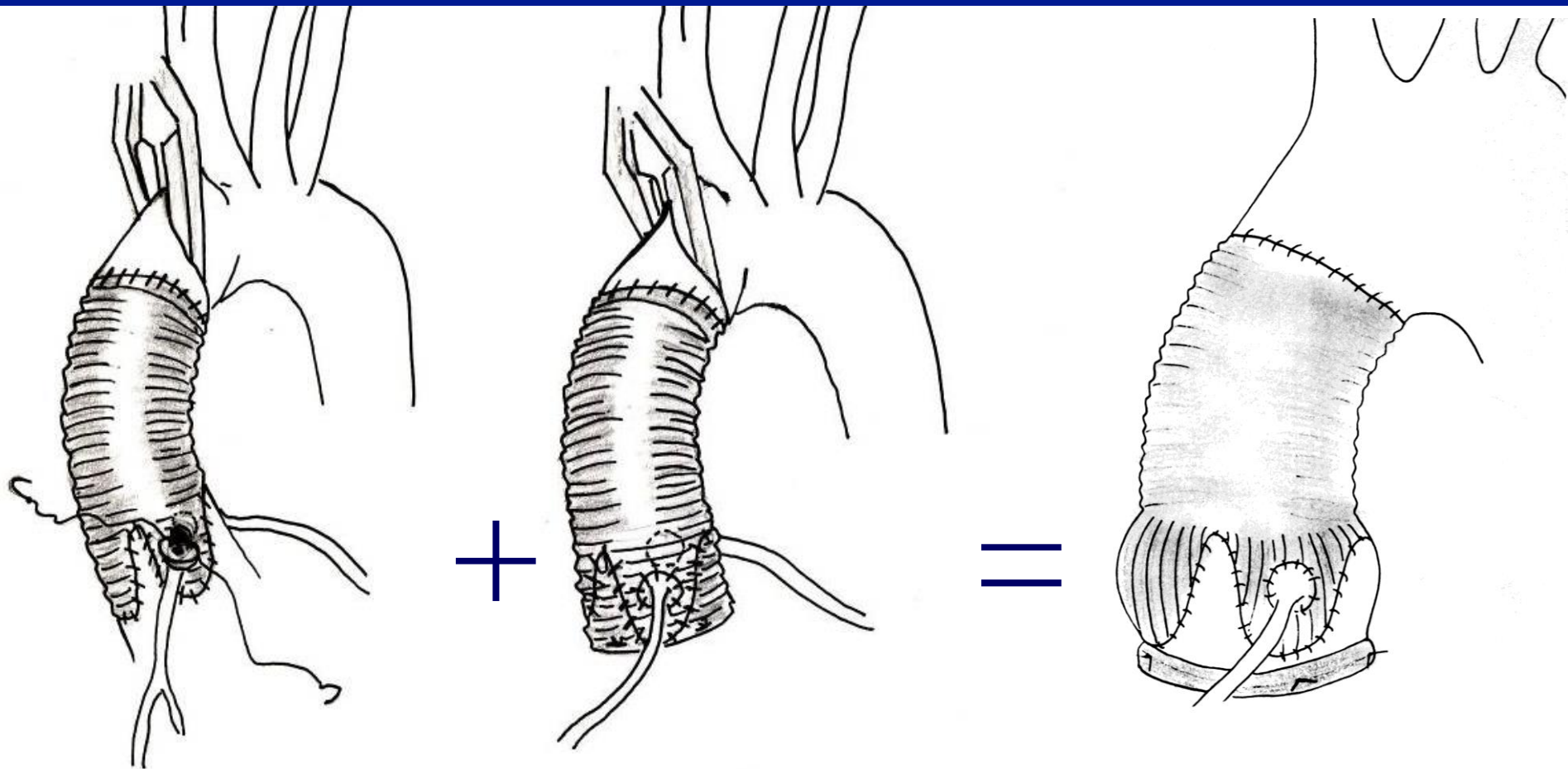
**Risk factor for failure of the Remodeling :  
Annulus dilation >25-28 mm**



**Reimplantation performs a subvalvular annuloplasty**

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

# Physiological and standardized approach to Valve Sparing Root Replacement

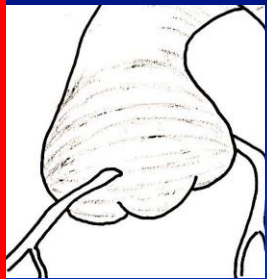


**Remodeling more physiologic  
RF failure annulus > 25 mm**

**Remodeling +  
subvalvular annuloplasty**



# Dystrophy of the ascending aorta pliable tricuspid valve



**Aortic root aneurysm**

Valsalva  $\geq 45$  mm



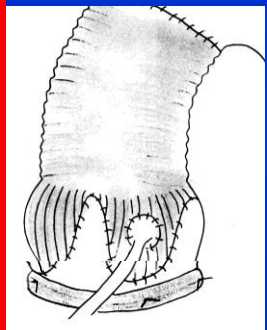
**Supra-coronary aneurysm**

Valsalva  $< 40$  mm

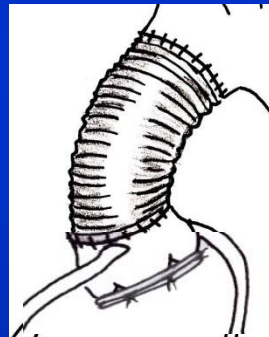


**Isolated AI**

all  $\emptyset < 40$  mm



**Remodeling  
+ subvalvular annuloplasty**



**Supra-coronary graft  
+ subvalvular annuloplasty  
(annulus  $> 25$  mm)**



**Subvalvular annuloplasty  
(annulus  $> 25$  mm)**

## Cusp repair



**Alignment of the cusp free edges**



**Resuspension of cusp effective height**

+

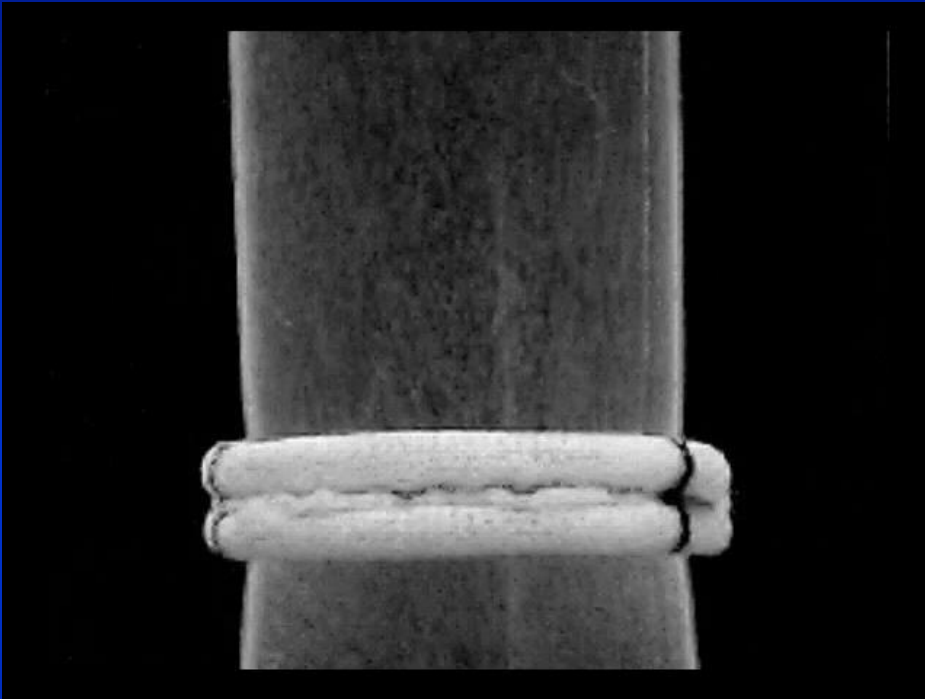


**Subvalvular external aortic annuloplasty**





# An Expandible aortic ring



**Reduces aortic annular base diameter in diastole (-15%)**

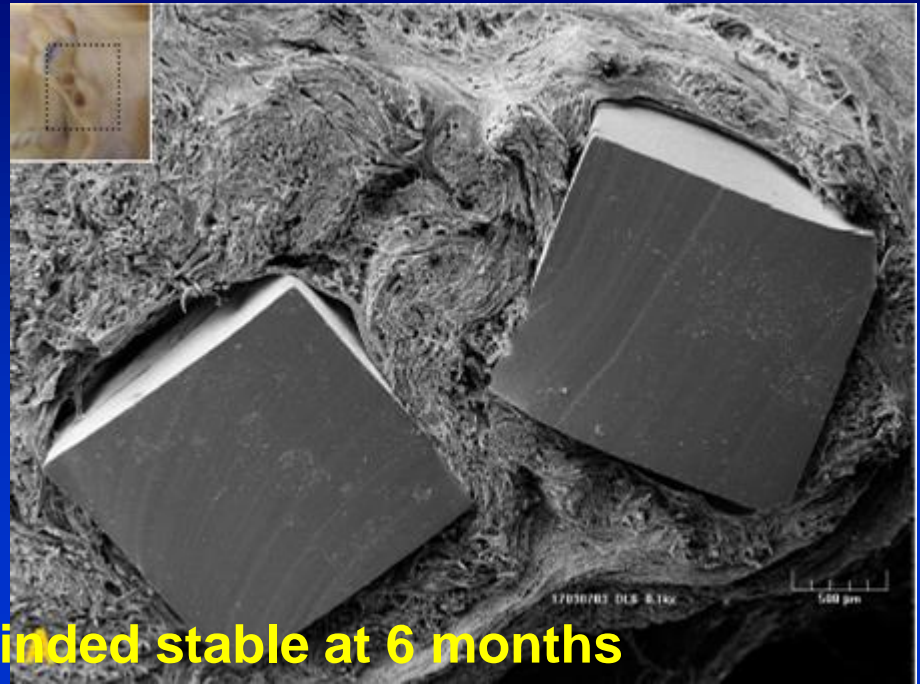
**Increases cusp coaptation height (+130%)**

**10% systolic expansibility mimics natural annulus dynamics**

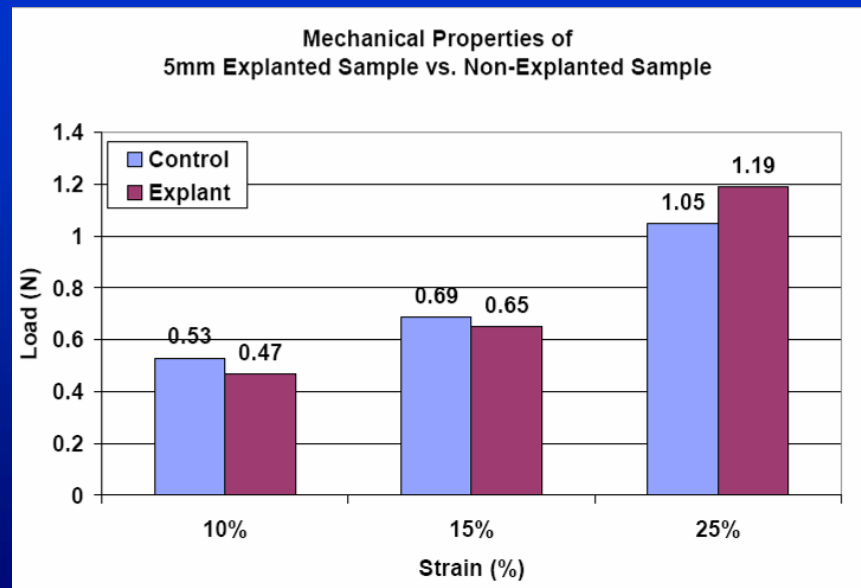
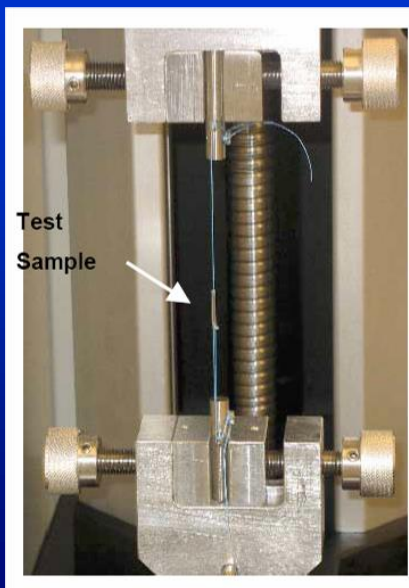
**Protects the repair and reduces cusps' stress**

# Pre implantation

# 6 months post op



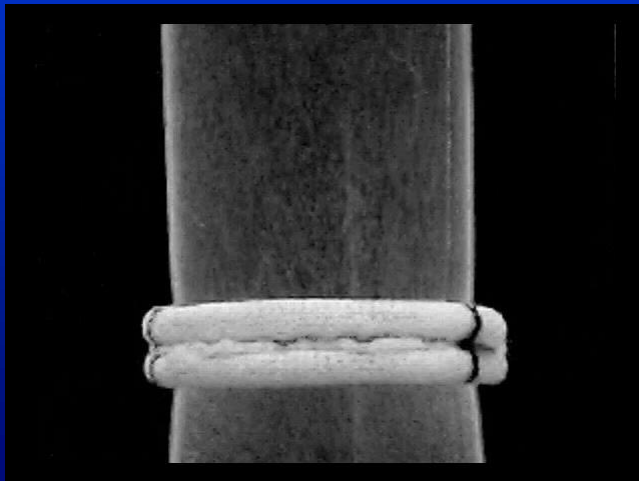
**Silicone properties remained stable at 6 months**



# Standardization based on aortic annulus Ø

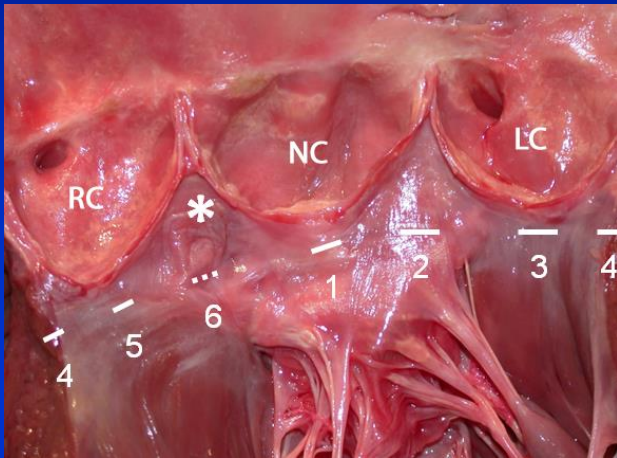
 Valsalva graft® Ø (mm)	Aortic annular base Ø (Hegar dilators, mm)				
	25-27	28-30	31-35	36-40	> 40
Extra aortic ring® Ø (mm)	26	28	30	32	34
Extra aortic ring® Ø (mm)	25	27	29	31	33

**Subvalvular ring = down size from one size**

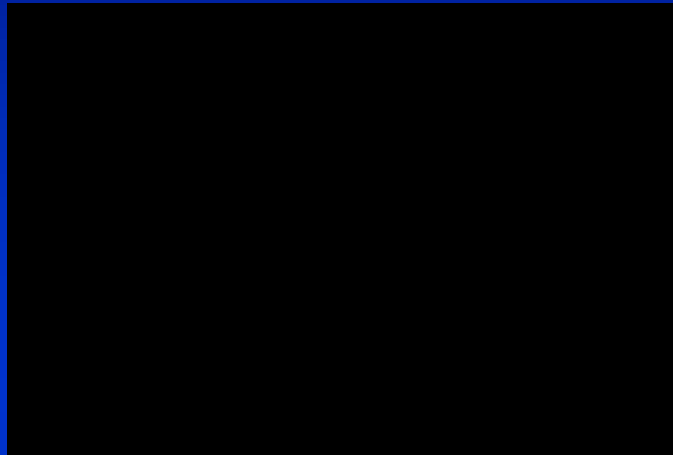


# Standardization step by step

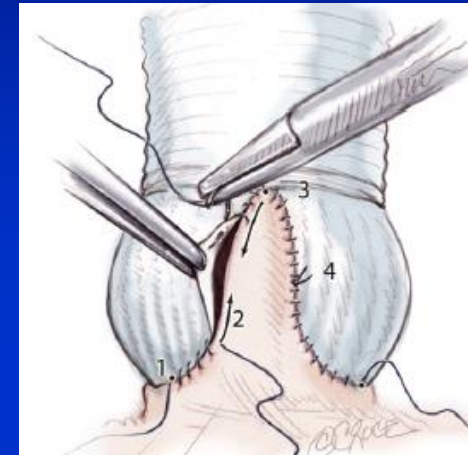
6 subvalvular « U »  
stitches



Alignment of cusp free  
edges prior Remodeling

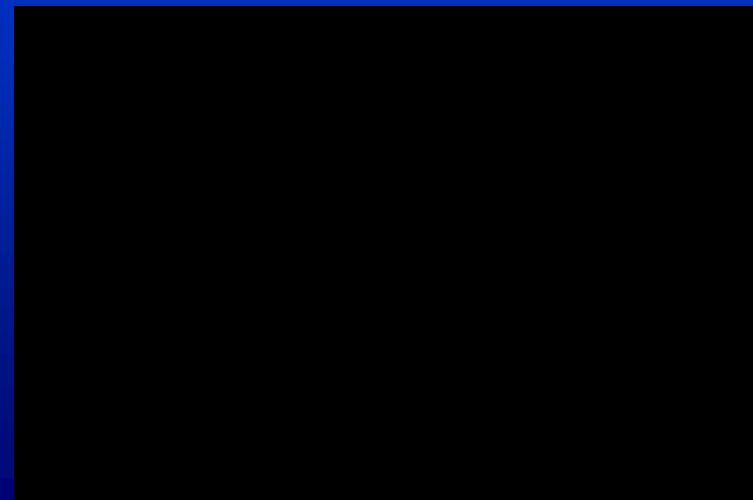
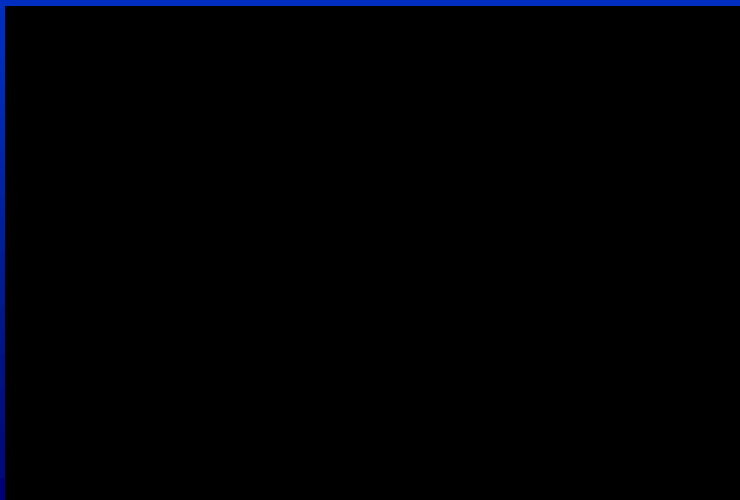


Suture of the  
Remodeling



Cusp resuspension after the Remodeling  
(effective height  $\geq 9$  mm)

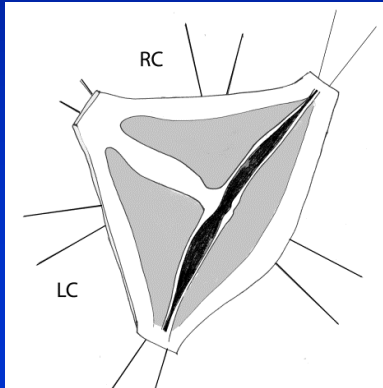
Subvalvular ring  
implantation



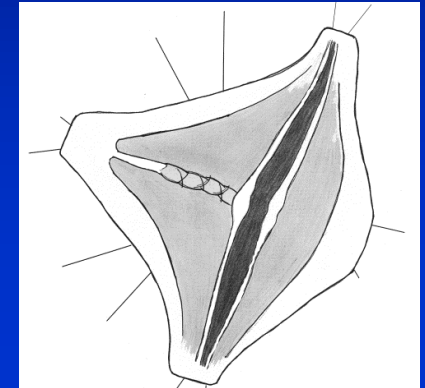
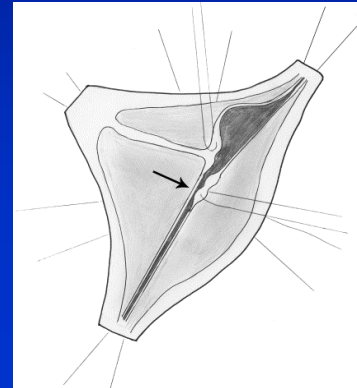
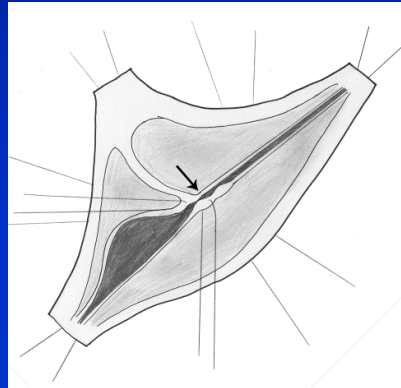
# Root aneurysms: Bicuspid valves

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

6 subvalvular  
« U » stitches



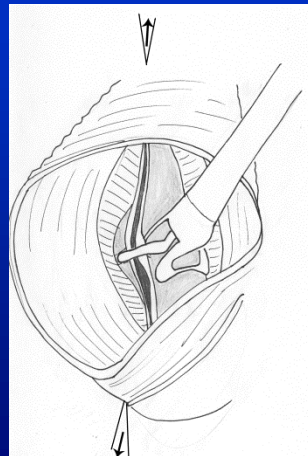
Alignment of cusp free edges



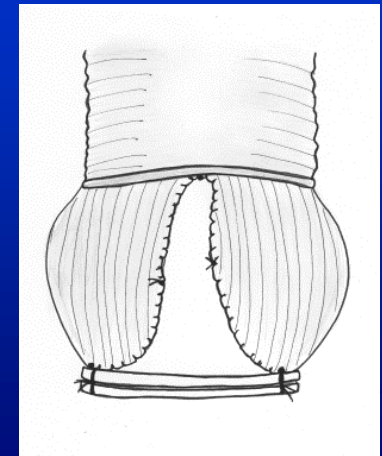
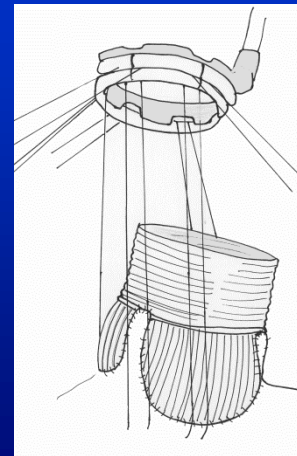
Commissures  
at 180°



Effective height  
measurement

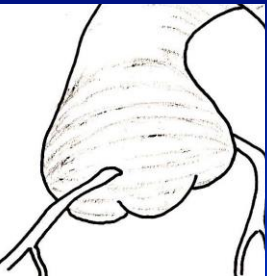


Subvalvular aortic annuloplasty



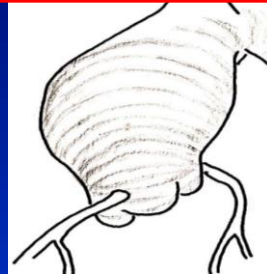


# Dystrophy of the ascending aorta pliable bicuspid valve



**Aortic root aneurysm**

Valsalva  $\geq 45$  mm



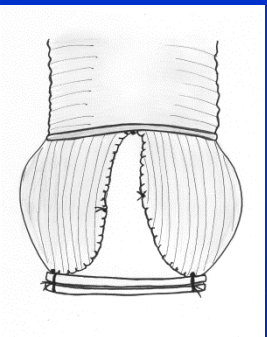
**Supra-coronary aneurysm**

Valsalva  $< 40$  mm  
Supra coronary Aorta  $> 45$  mm

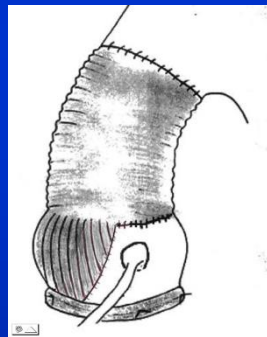


**Isolated AI**

Valsalva  $< 40$  mm  
Supra coronary Aorta  $< 40$  mm



**Remodeling  
+ sub-valvular annuloplasty**



**Supra-coronary graft  
+ sub-valvular annuloplasty  
(annulus  $> 25$  mm)**



**Supra-valvular annuloplasty  
(STJ  $> 35$  mm)  
Subvalvular annuloplasty  
(annulus  $> 25$  mm)**

## Cusp repair



**Alignment of the cusp free edges**



**Resuspension of cusp effective height**

+



**Subvalvular external aortic annuloplasty**



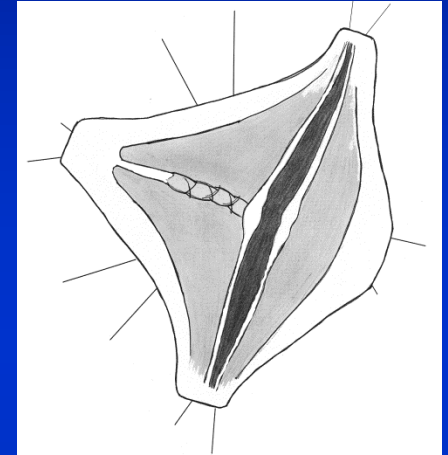
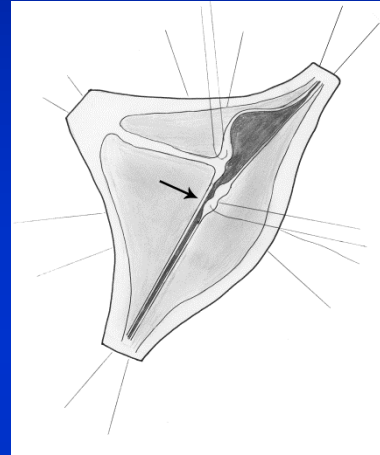
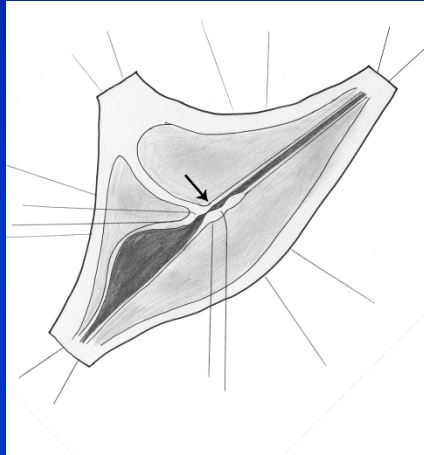
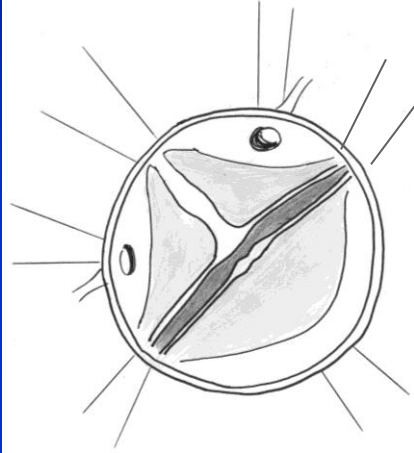


# Supra-coronary aneurysms

Bicuspid R-L (sinus  $\varnothing$  40 – 45 mm)

6 subvalvular  
« U » stitches

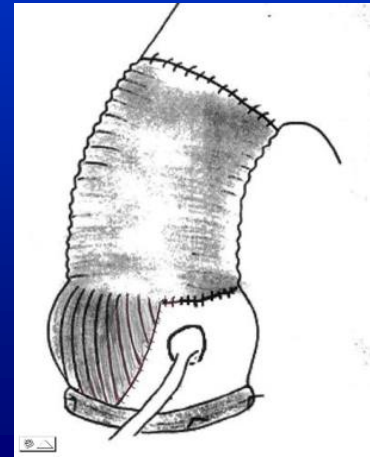
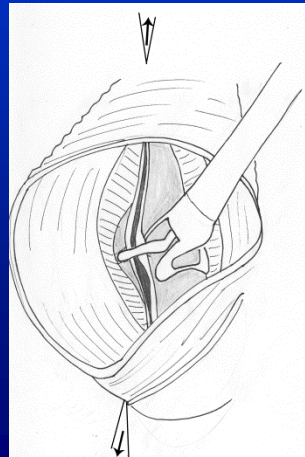
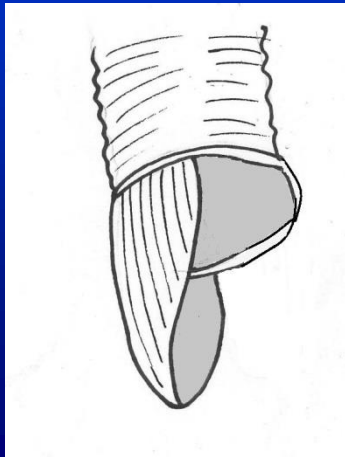
Alignment of cusp free edges

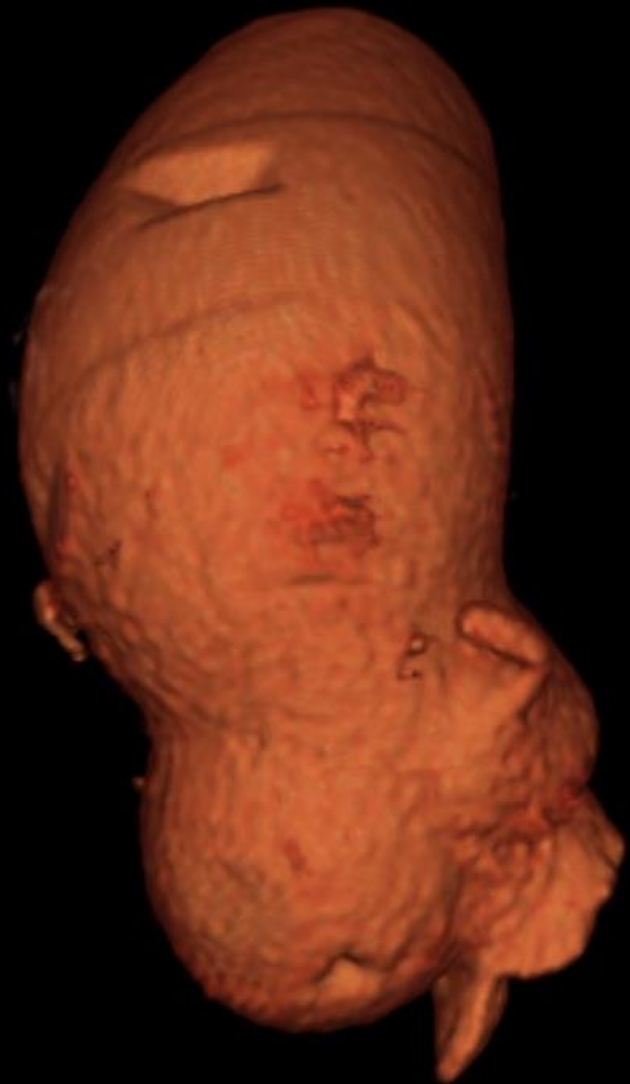
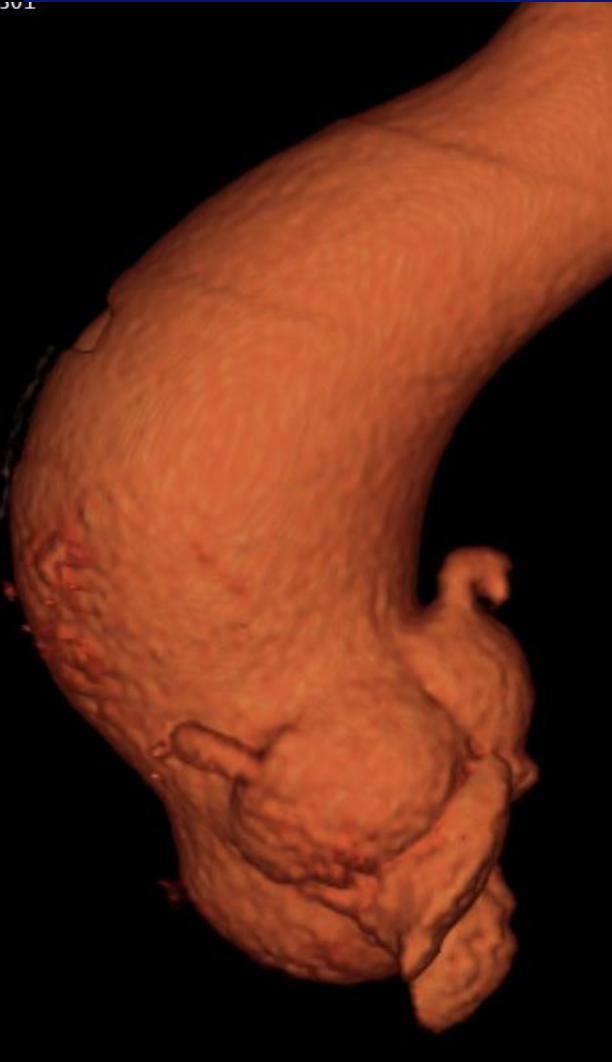
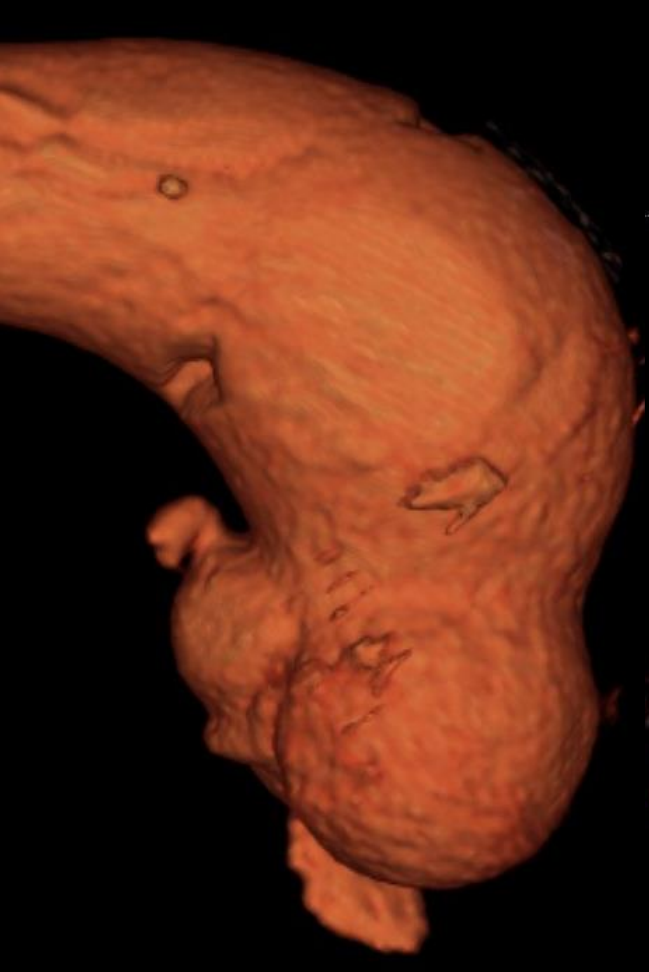


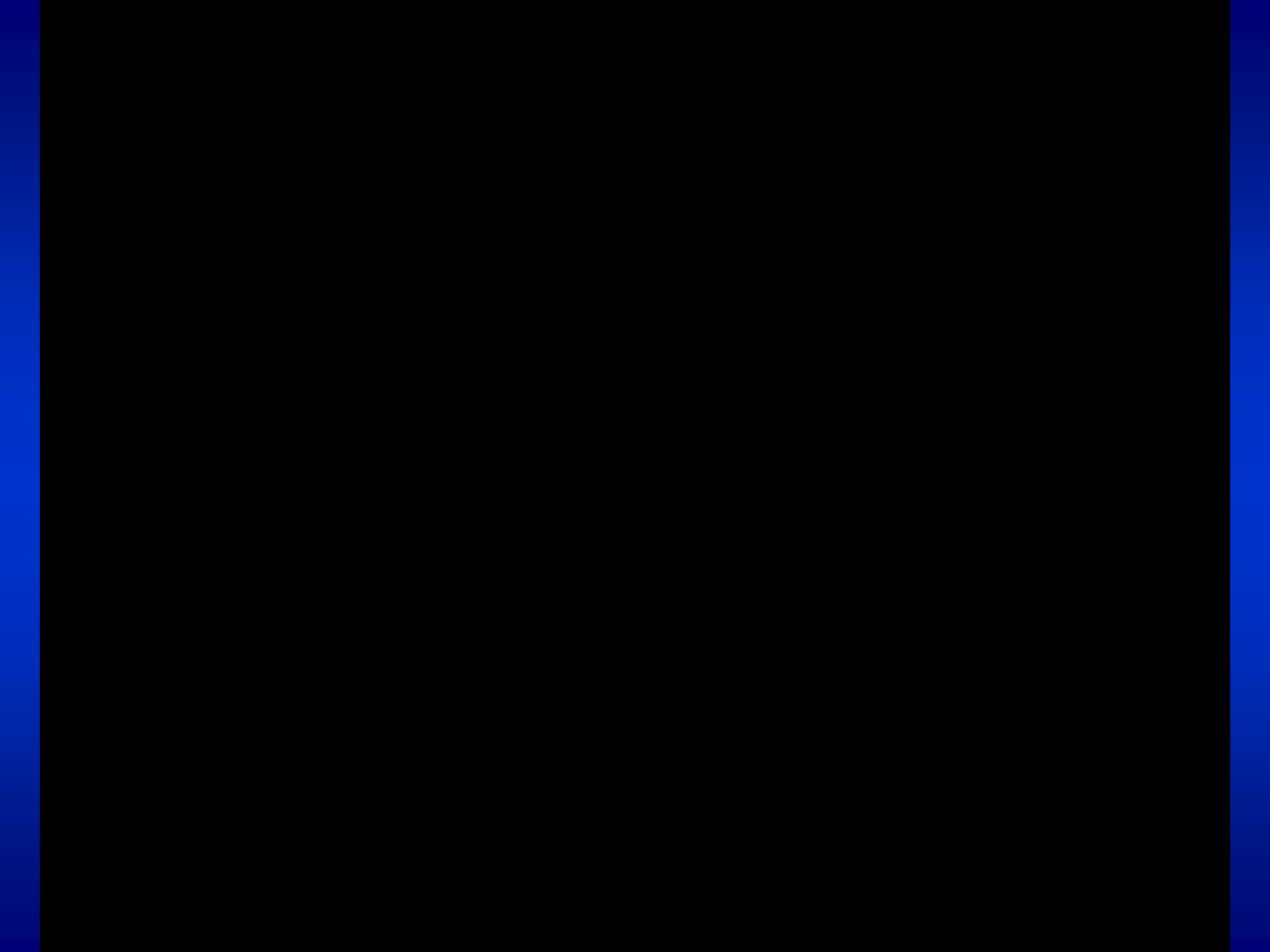
Commissures  
at 180°

Effective height  
measurement

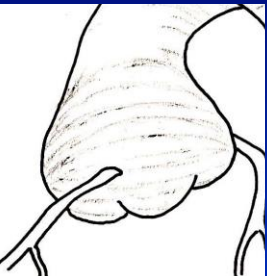
Subvalvular aortic  
annuloplasty





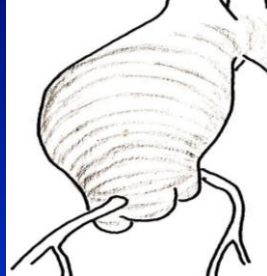


# Dystrophy of the ascending aorta pliable bicuspid valve



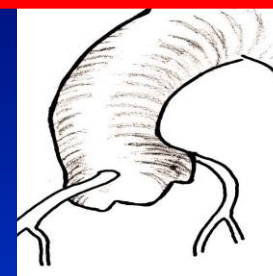
**Aortic root aneurysm**

Valsalva  $\geq 45$  mm



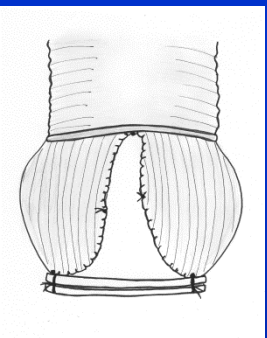
**Supra-coronary aneurysm**

Valsalva  $< 40$  mm  
Supra coronary Aorta  $> 45$  mm

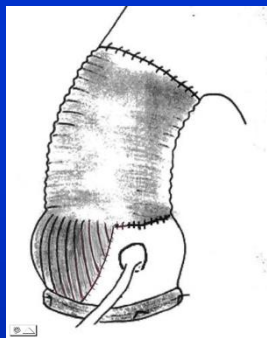


**Isolated AI**

Valsalva  $< 40$  mm  
Supra coronary Aorta  $< 40$  mm



**Remodeling  
+ sub-valvular annuloplasty**



**Supra-coronary graft  
+ sub-valvular annuloplasty  
(annulus  $> 25$  mm)**



**Supra-valvular annuloplasty  
(STJ  $> 35$  mm)  
Subvalvular annuloplasty  
(annulus  $> 25$  mm)**

## Cusp repair



**Alignment of the cusp free edges**



**Resuspension of cusp effective height**

+

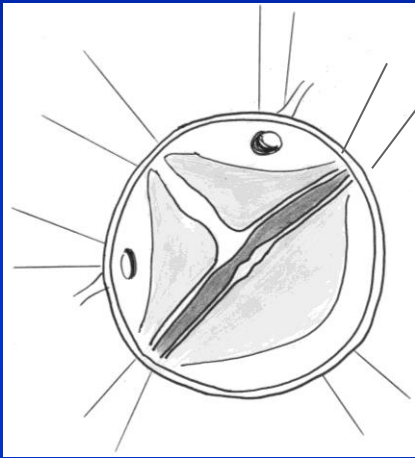


**Subvalvular external aortic annuloplasty**

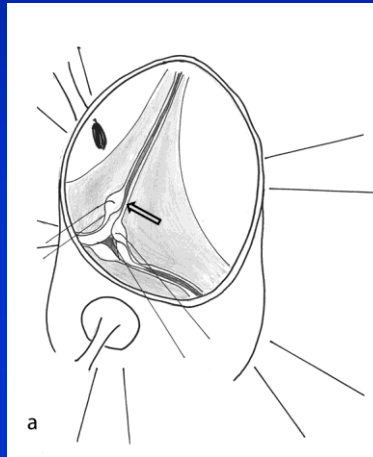


# Isolated aortic insufficiency (all diameters $\leq 40$ mm)

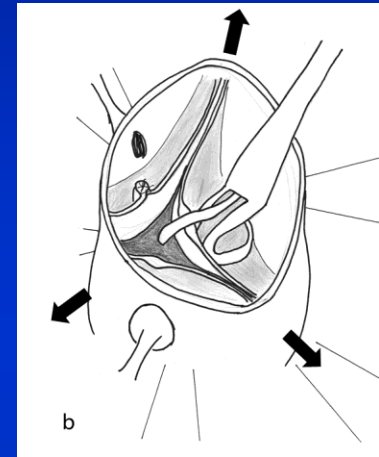
6 subvalvular « U »  
stitches



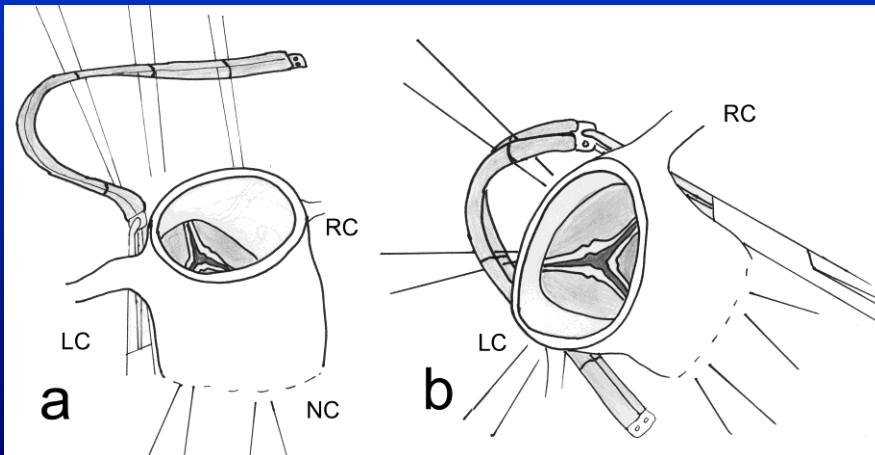
Alignment of cusp free edges



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



Placement of the open subvalvular ring  
below the coronaries



Final aspect



