

# Réparation/Conservation de la valve aortique (CAVIAAR)



Les attentes du chirurgien...  
S.Lopez E.Lansac



# Bentall: gold standard?

**Class I:** (...) Patients with Marfan, Loeys-Dietz, and Ehlers-Danlos syndromes and other patients with dilatation of the aortic root and sinuses of Valsalva should undergo excision of the sinuses in combination with a modified David reimplantation operation if technically feasible or, if not, root replacement with valved graft conduit. (*Level of Evidence: B*)

## Aortic Valve and Root

In patients with aortic valve regurgitation and root dilatation, aortic valve repair and root sparing procedure may be the primary procedure. In patients with Marfan syndrome or with tricuspid aortic valve regurgitation, a modification of the David reimplantation operation may be considered.

# Surgical techniques in aortic disease

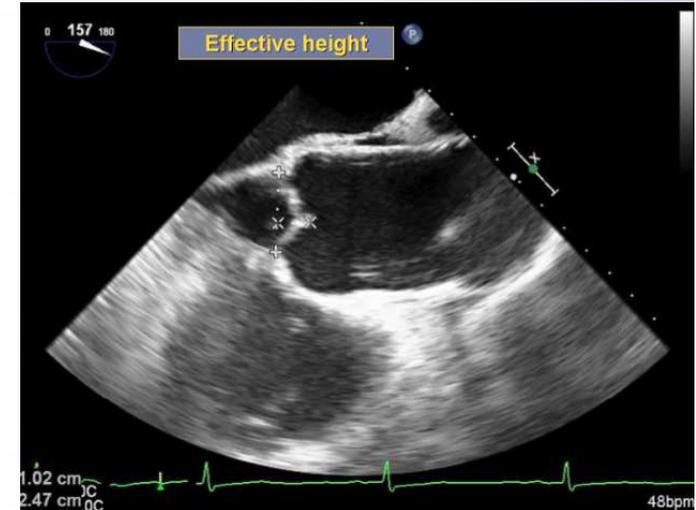
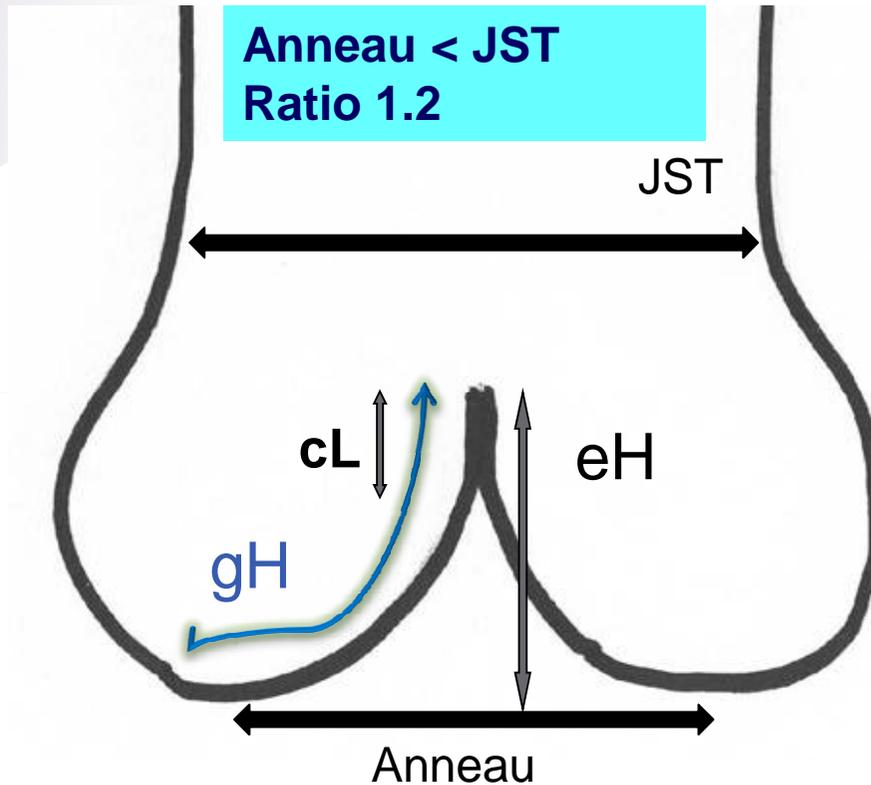
Recommendations	Class	Level
Cerebrospinal fluid drainage is recommended in surgery of the thoracoabdominal aorta to reduce the risk of paraplegia.	<b>I</b>	<b>B</b>
Aortic valve repair using the reimplantation technique or remodelling with aortic annuloplasty is recommended in young patients with aortic root dilatation and tricuspid aortic valves.	<b>I</b>	<b>C</b>
For repair of acute type-A aortic dissection (AD), an open distal anastomotic technique avoiding aortic clamping (hemiarch/complete arch) is recommended.	<b>I</b>	<b>C</b>
In patients with connective tissue disorders requiring aortic surgery, the replacement of aortic sinuses is indicated.	<b>I</b>	<b>C</b>
Selective antegrade cerebral perfusion should be considered in aortic arch surgery to reduce the risk of stroke.	<b>IIa</b>	<b>B</b>
The axillary artery should be considered as first choice for cannulation for surgery of the aortic arch and in aortic dissection.	<b>IIa</b>	<b>C</b>
Left heart bypass should be considered during repair of the descending aorta or the thoracoabdominal aorta to ensure distal organ perfusion.	<b>IIa</b>	<b>C</b>



# **Vers une approche physiologique et standardisée de la réparation valvulaire aortique**

**→ Connaitre les paramètres de  
la coaptation valvulaire**

# \* Paramètres de la coaptation valvulaire



- **Coaptation L = 4-5 mm** → 2 feuillets !
  - **Effective H ≥ 9 mm**
  - **Geometric H ≥ 16 mm**  
(19 mm bicuspid)
- 1 feuillet !

Bierbach EJTCVS 2010

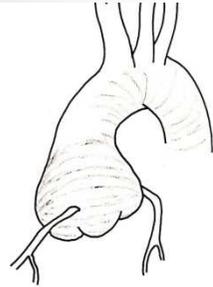
Tamas JHVD 2007

# **Vers une approche physiologique et standardisée de la réparation valvulaire aortique**

**→ Savoir à quels patients proposer  
une conservation/réparation  
valvulaire**

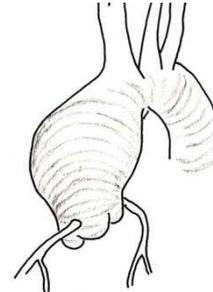
# Phénotype de la racine

Root  
aneurysm



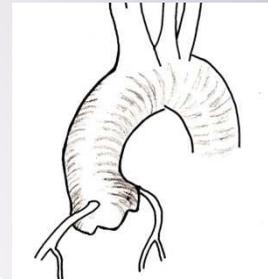
Valsalva  $\geq 45$  mm

Supra coronary  
aneurysm



Valsalva  $\leq 40$  mm

Isolated AI



All  $\varnothing \leq 40$  mm

## Mobilité des feuillets

Normal (I)

Prolapsus (II)

Restriction (III)

## Nombre de feuillets

Tricuspide

Bicuspide

Tous sont de Potentiels candidats

sauf gH  $< 16$ mm

# Vers une approche physiologique et standardisée de la réparation valvulaire aortique

## Protocole ECHO → Stratégie de réparation

- Aorte: diamètres ?
- Tricuspide/Bicuspide
- Mouvements des feuillets: prolapsus, restriction ?
- Jet: direction ?

Heart Team

P. Meyer, Ph Durand

CJ Mariotini, L Drogoul

JP. Elbeze, A. Mihoubi

J. Teboul, M. Tapia

*Département d'anesthésie-réanimation*

**Protocole Echo pour les Insuffisances  
Aortiques et les Anévrismes de la Racine  
(CAVIAAR)**

JP. Elbeze, A. Mihoubi

« POLE » des PATHOLOGIES AORTIQUES



# Intra-op 2D-TEE Protocol

Long axis  
120-140°



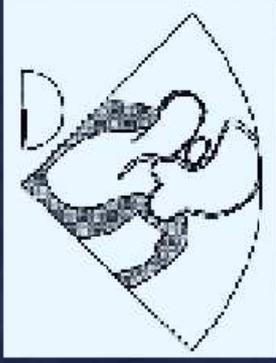
Aorta Phenotype  
Jet direction  
Cusp Motion  
Effective height  
Coaptation length

Short axis  
45°-60°

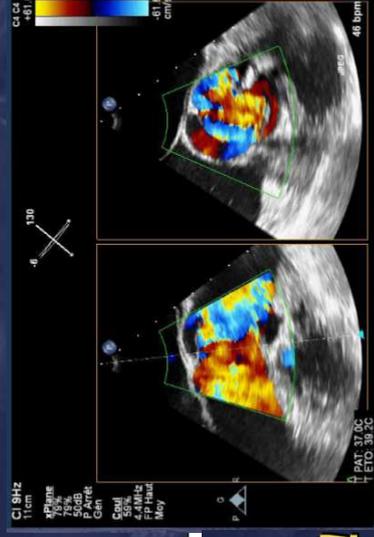


Number of cusps  
Raphe  
Jet origin and extension  
Commissural orientation

Deep transgastric view



Jet direction  
CW Doppler  
(PHT, Gradients)  
Effective height  
Coaptation length



**All in one  
Ask for X Plane !**

**Aortic Valve Repair  
a step by step approach**

**Echo road map  
analysis for aortic  
valve repair strategy**



A. Berrebi, M.D.

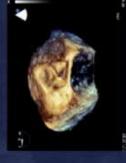
**caviaar.com**

## How to identify each cusp by echo ?

- ✓ 2D: Long axis with probe rotation
- ✓ 3D X plane
- ✓ 3D Q Lab MPR

## Aortic Valve Repair a step by step approach

Echo road map  
analysis for aortic  
valve repair strategy



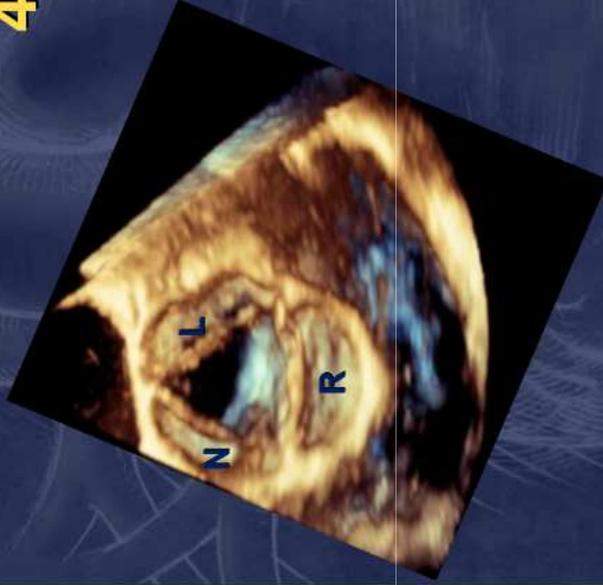
A. Berrebi, M.D.

# Aortic Valve

Echo view

45°

Surgical view



**Aortic Valve Repair  
a step by step approach**



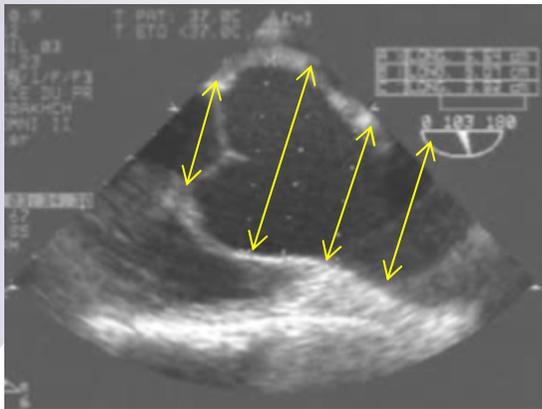
**Echo road map  
analysis for aortic  
valve repair strategy**



A. Berrebi, M.D.

# ETT et ETO pré-opératoire

4 diamètres



Bicuspidie?

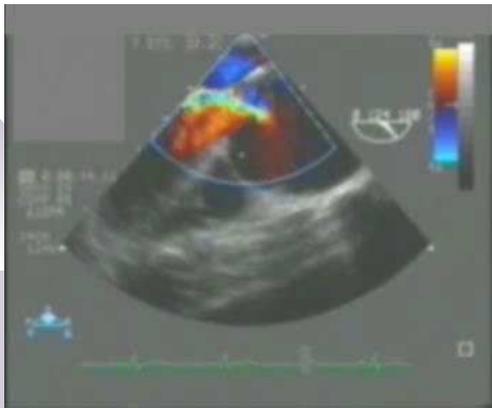


Coaptation



## Direction du jet

Central



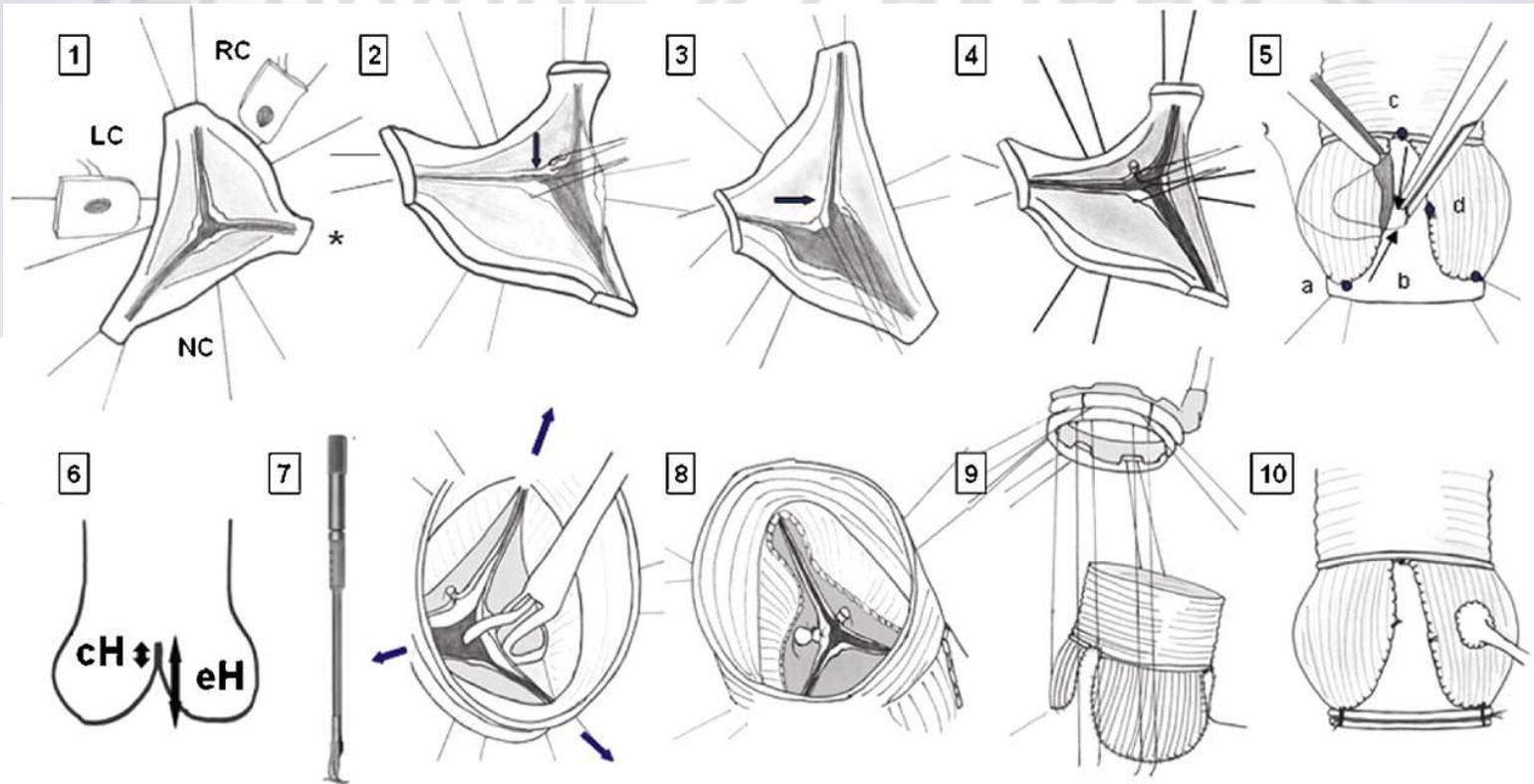
Excentré Mitrale  
Prolapsus CD



Excentré septum  
Prolapsus NC ou CG



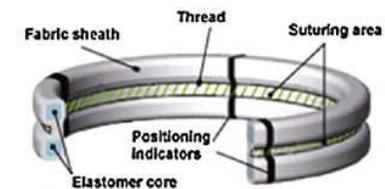
# Technique « CAVIAAR »



11

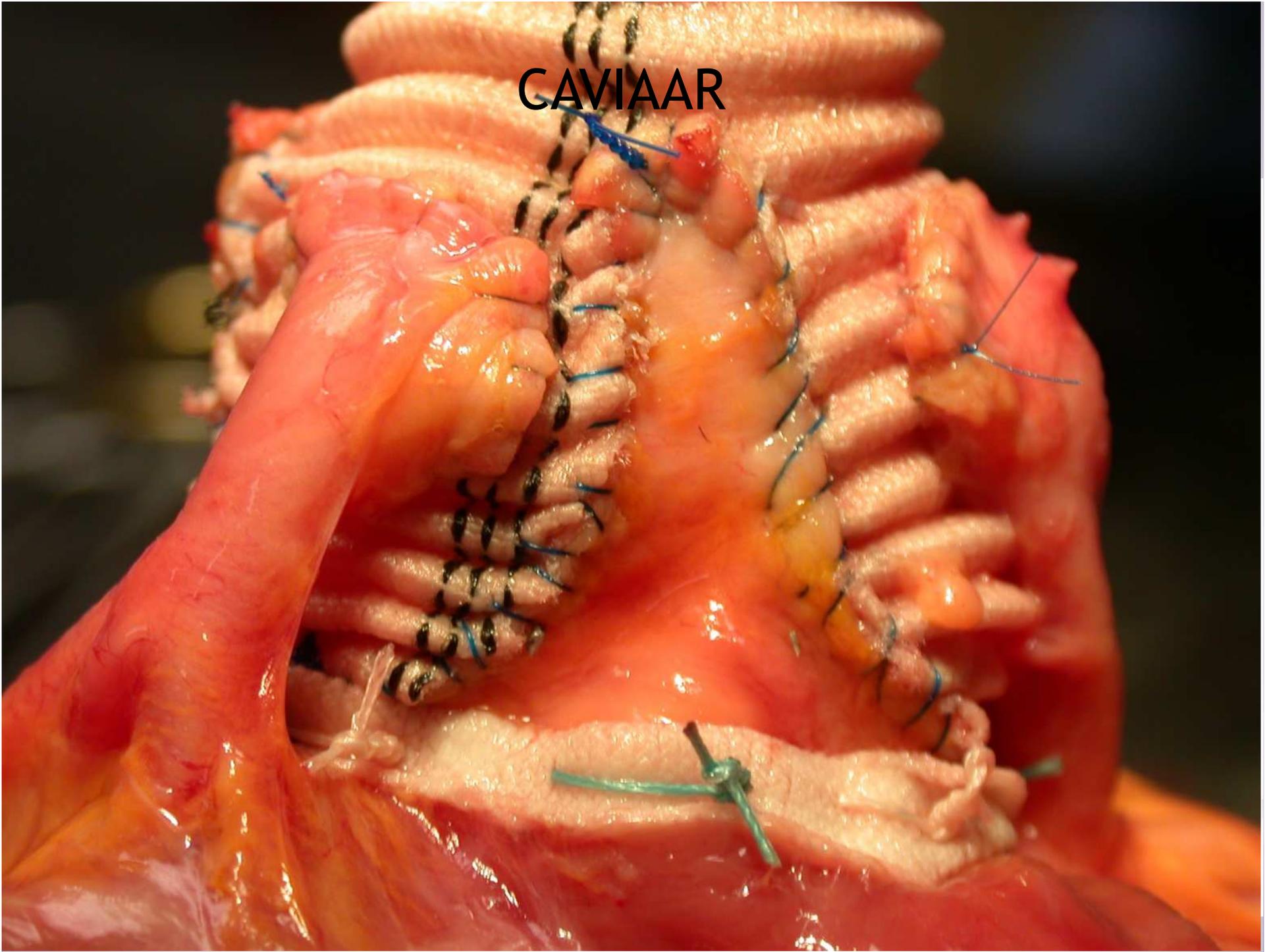
	Ø Aortic annular base (mm)			
	25-26	27-28	29-30	31-32
Ø Tube graft (Valsalva)	26	28	30	32
Ø Subvalvular ring	25	25	27	29

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EUROPEAN JOURNAL OF  
CARDIO-THORACIC SURGERY

CAVIAAR



3D phase 80%  
Ex: 6209  
Se: 532

Volume Rendering No cut

DFOV: 19.6cm  
STND/C2 Ph:80% (No Filtr.)

RPS

CHU BICHAT  
HERNANDEZ JOSE  
M 59 -2807036772  
DoB: Aug 16 1948  
Ex: Sep 07 2007

-22 L 63 LAO 70 CRA



A  
R

P  
L

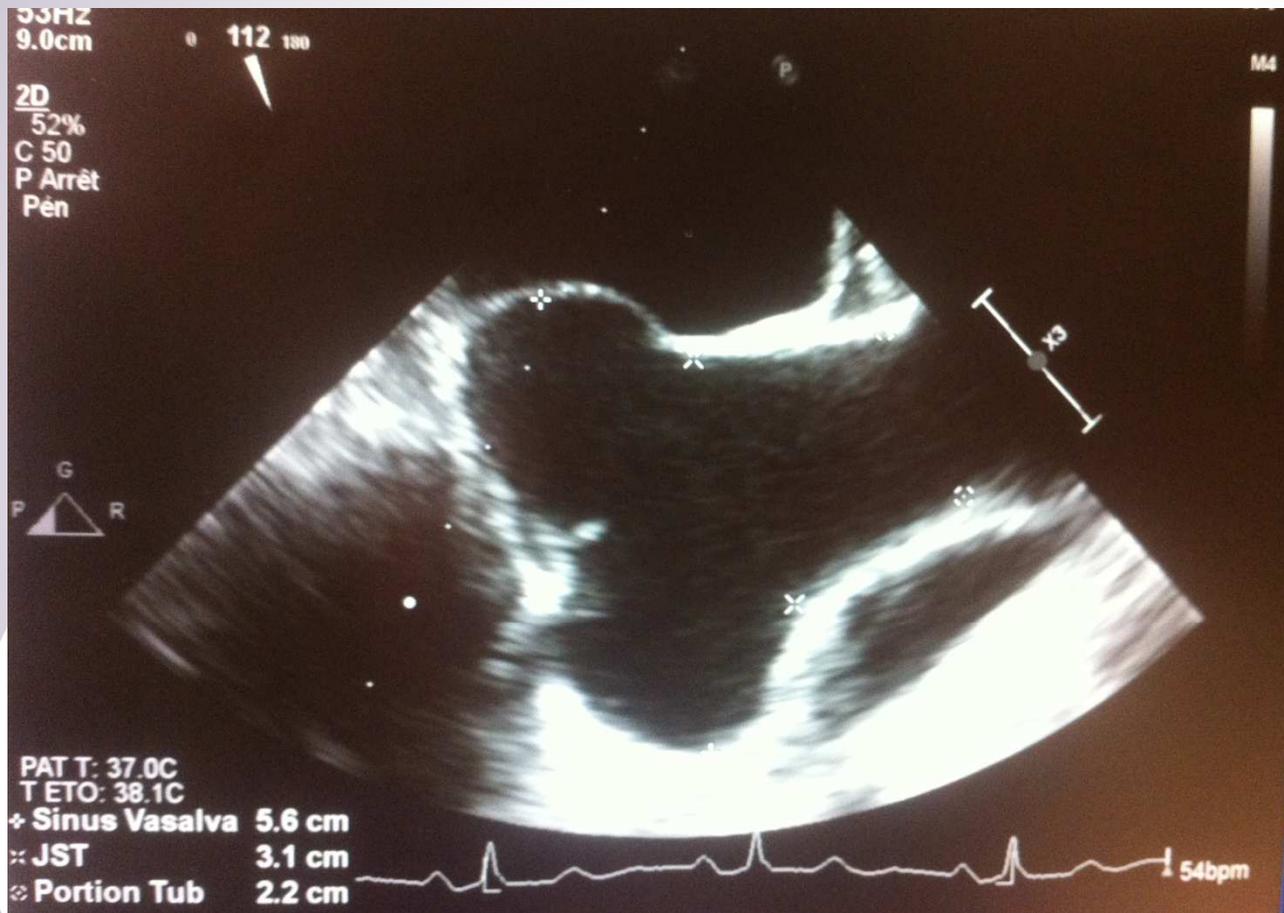
LAI

No V01  
kv: 120  
mA: Mod.  
Rot: 0.35s./CH 8.0mm/rot  
0.6mm 0.2:1/0.6sp  
Tilt: 0.0  
11-27-12 AM  
W = 4095 L = 2048

# \* Cas clinique

- \* Femme de 43 ans
- \* Elher-Danlos type IV
- \* Contre-indication aux AVK : épilepsie et Sd schizoïde
- \* NYHA II

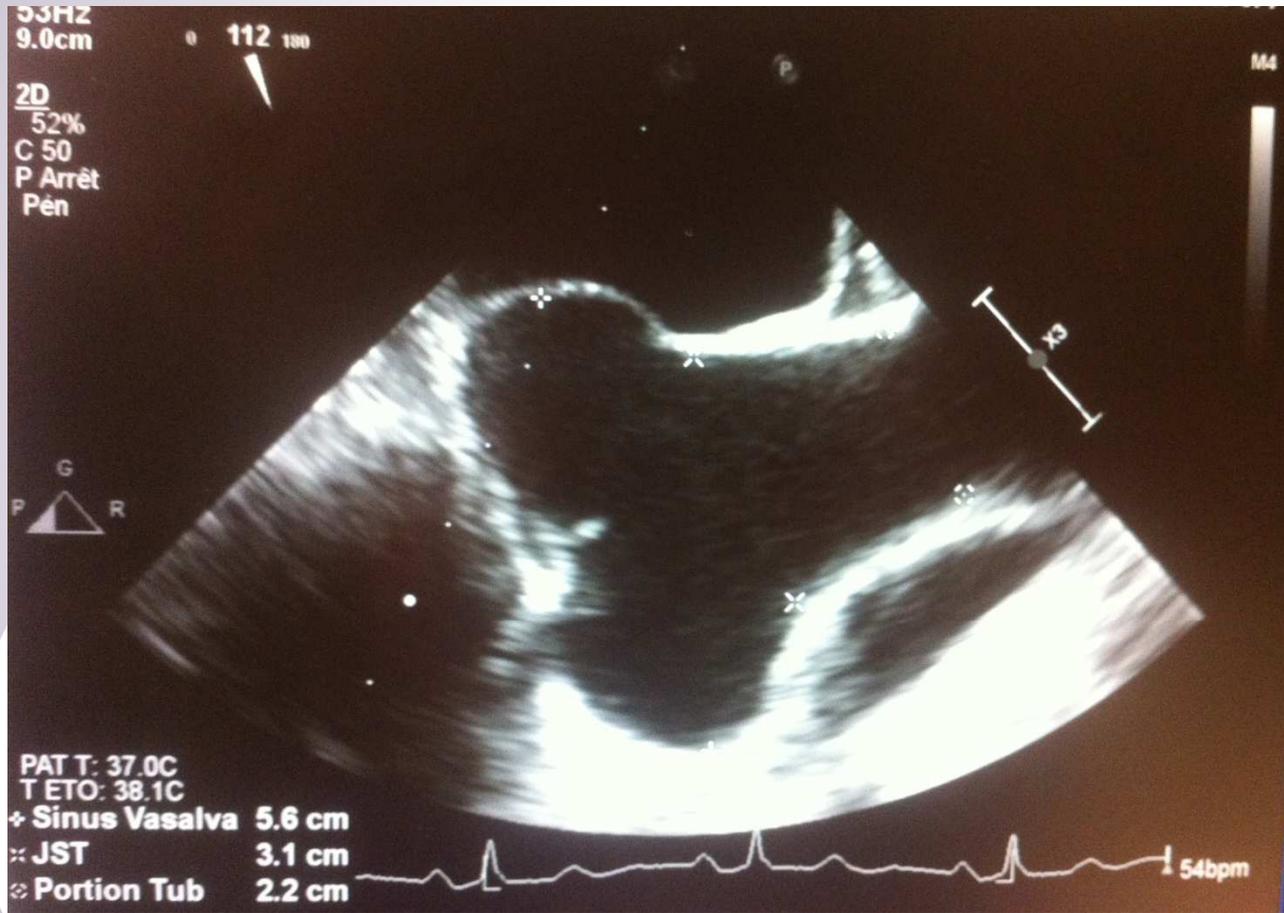
**\* Anévrisme de la racine aortique et insuffisance aortique sévère**



photos 3 1217.MOV

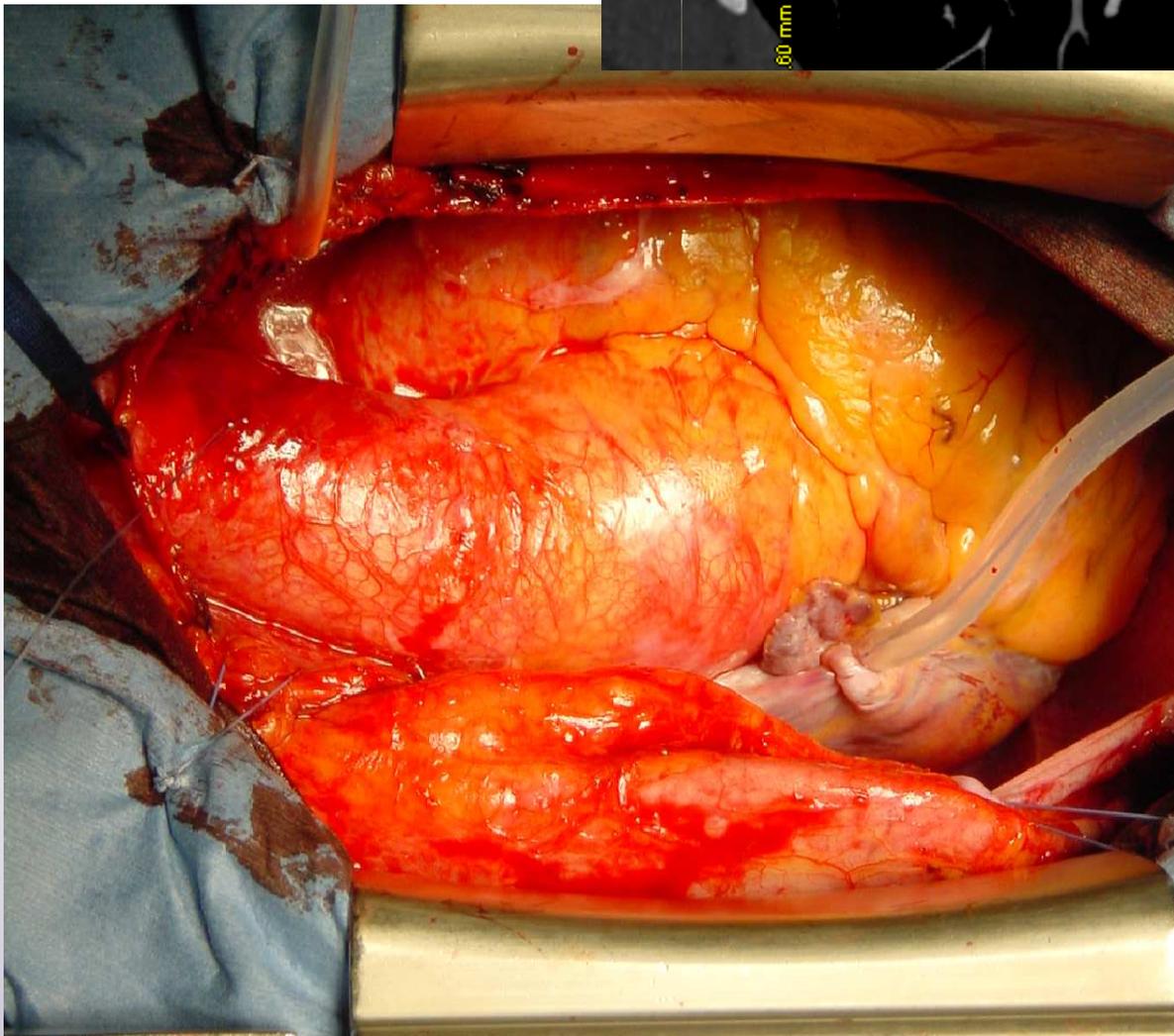
\* Racine 56 mm  
JST 31  
anneau 23

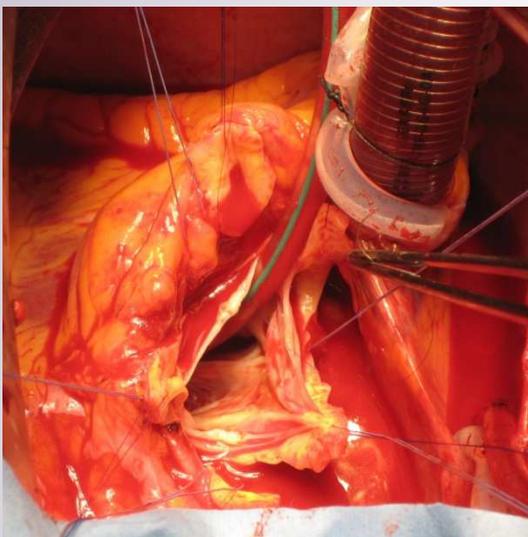
Jet central  
Pas d'extension  
commissurale



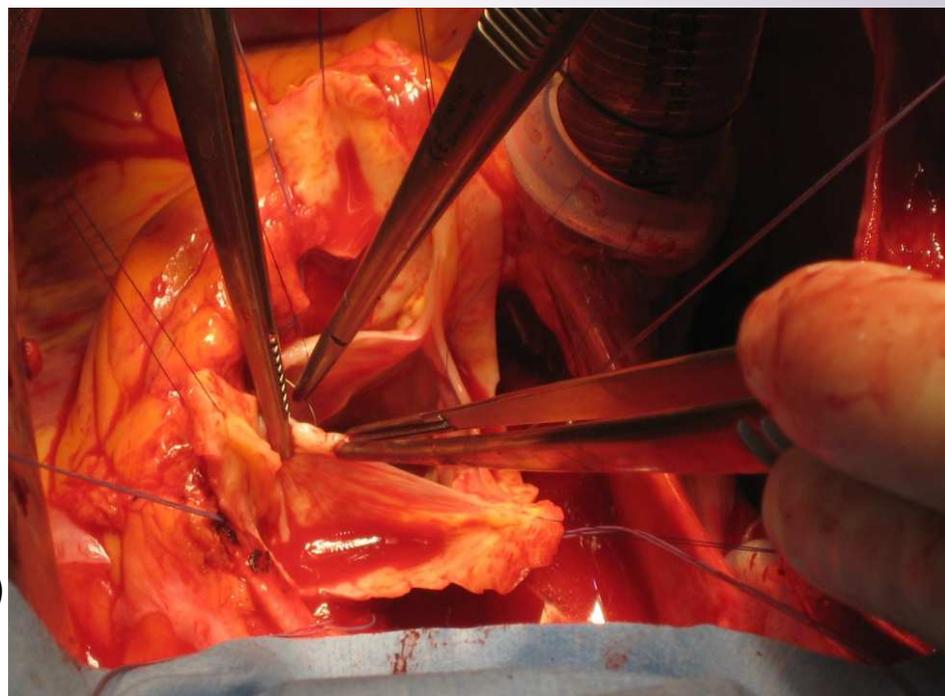
photos 3 1218.MO'

\* laos sévère, centrale, légèrement excentrée vers le septum

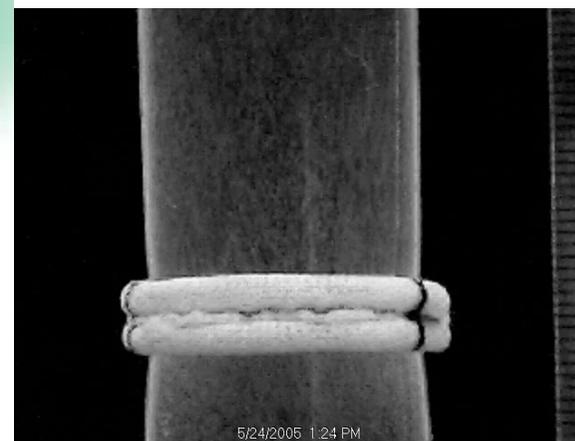




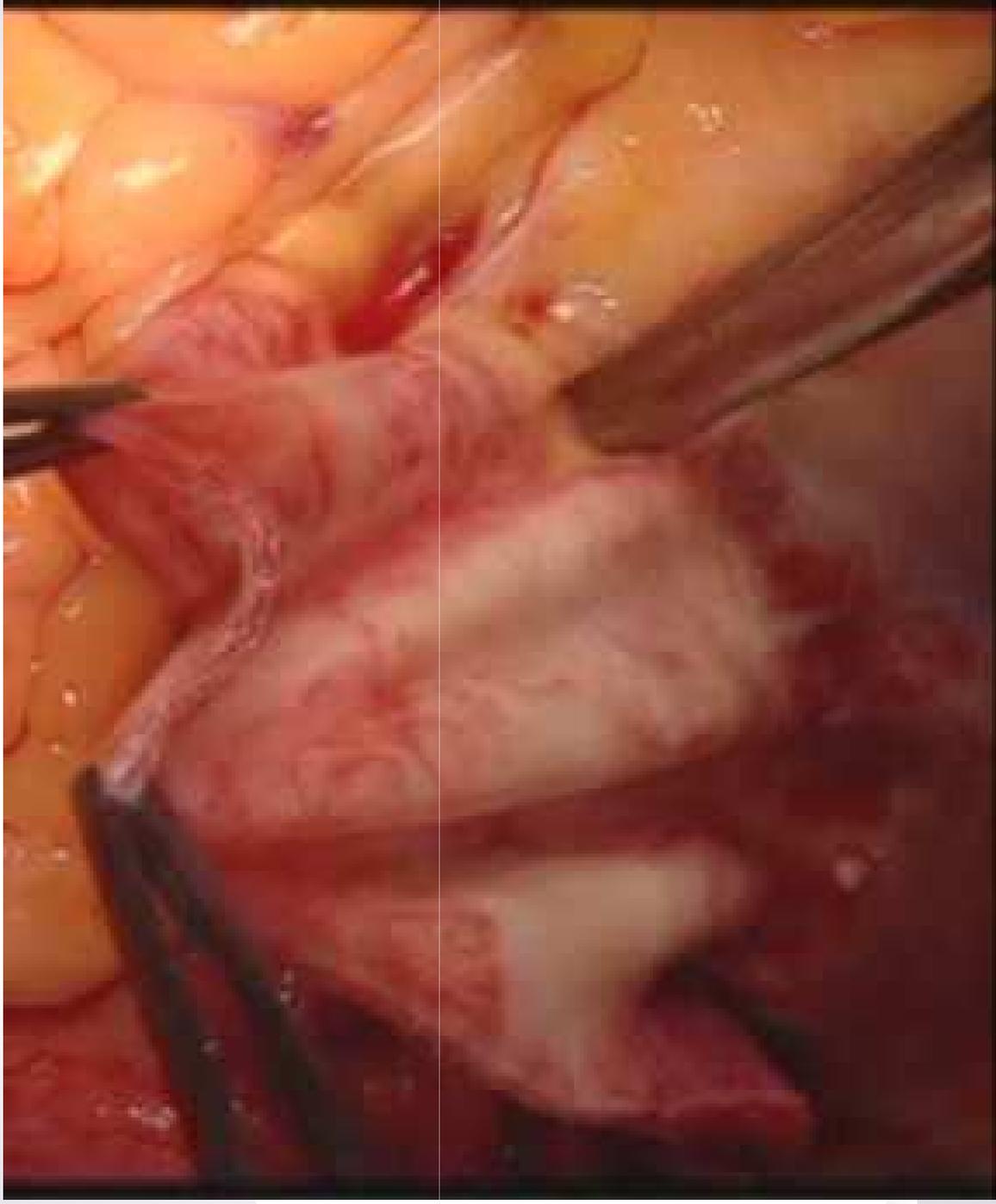
Geometric H: 17 mm (g/d) et 20 mm (nc)  
Anneau à la bougie: 25 mm



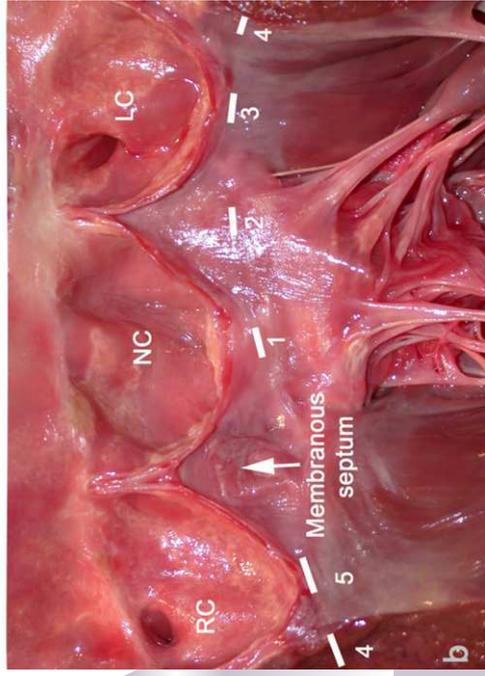
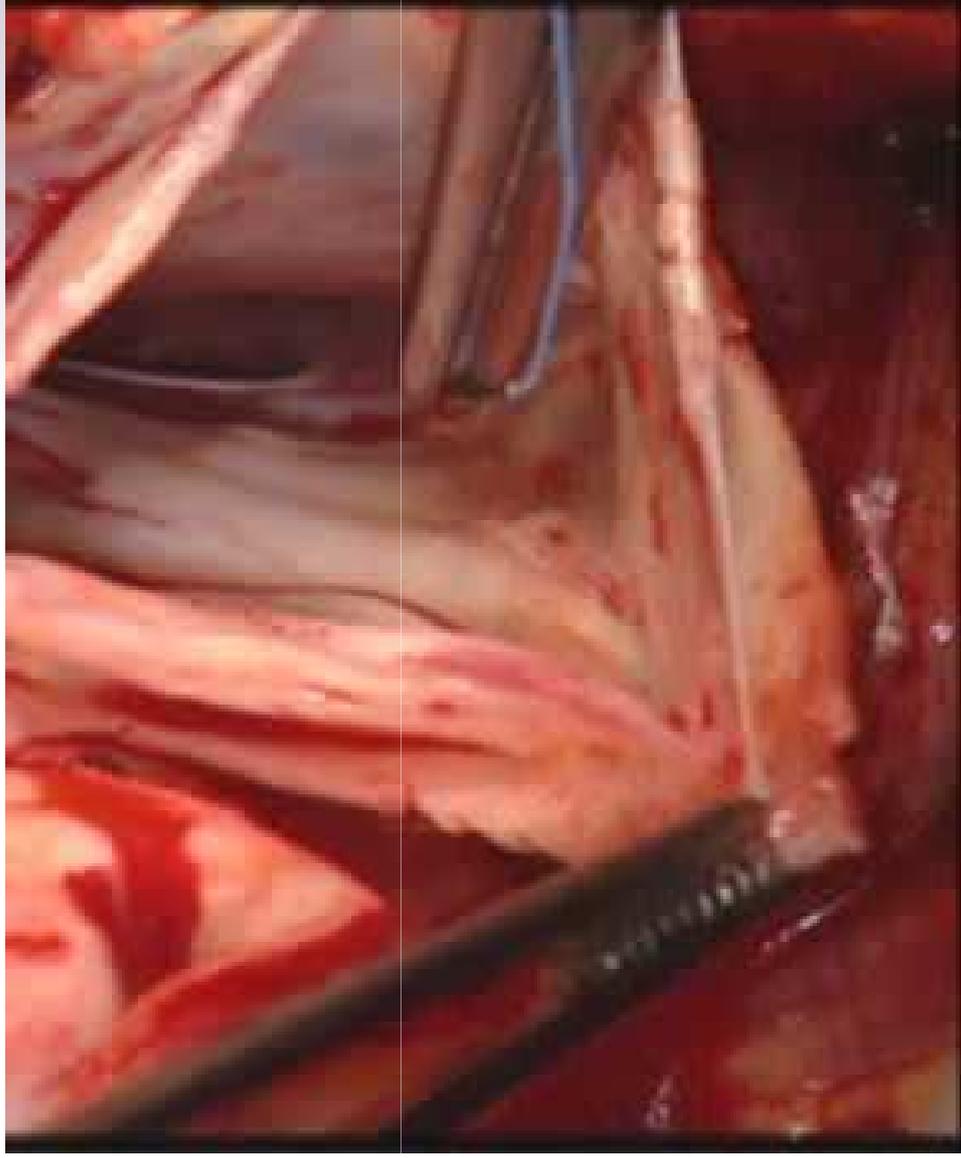
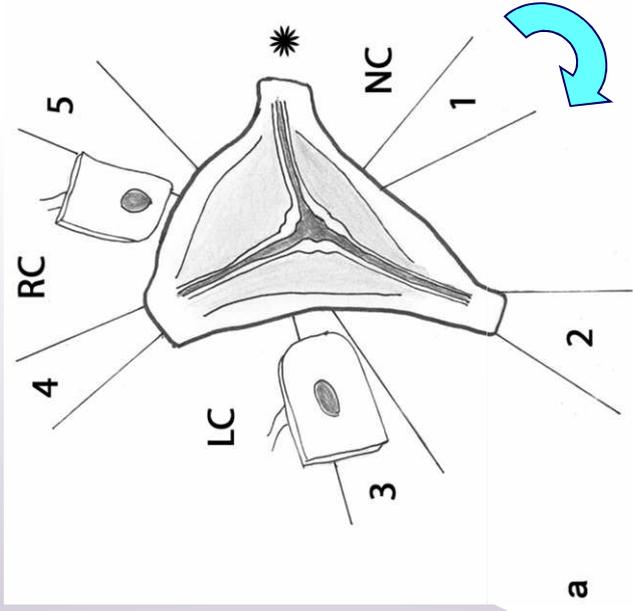
→ Tube 26 mm et Anneau extra ao 25 mm



# 1. Dissection du plan sous-valvulaire

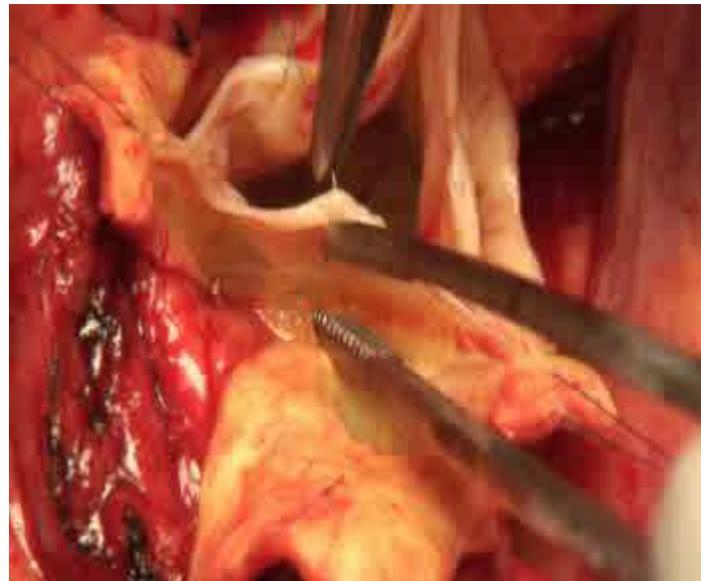
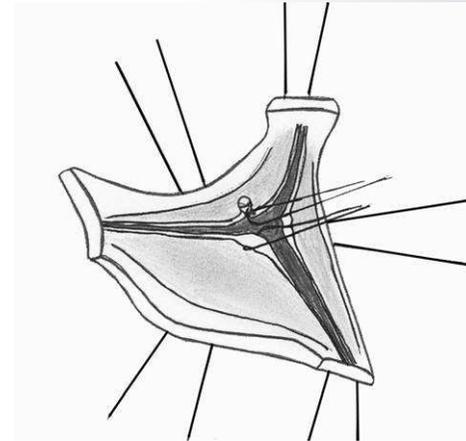
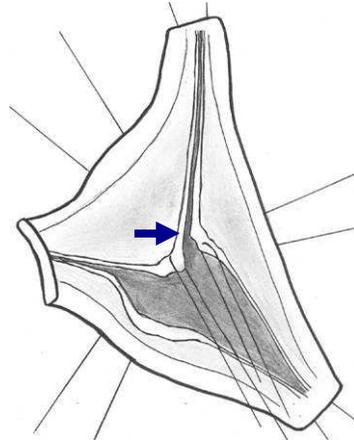
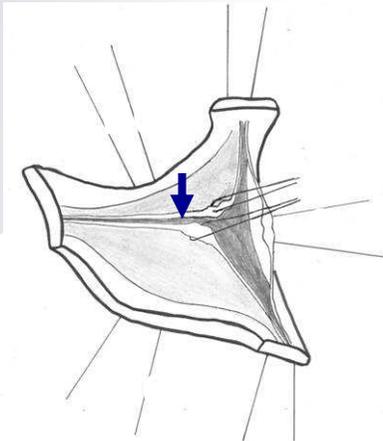


# 2: 5 points en « U » » sous-valvulaires

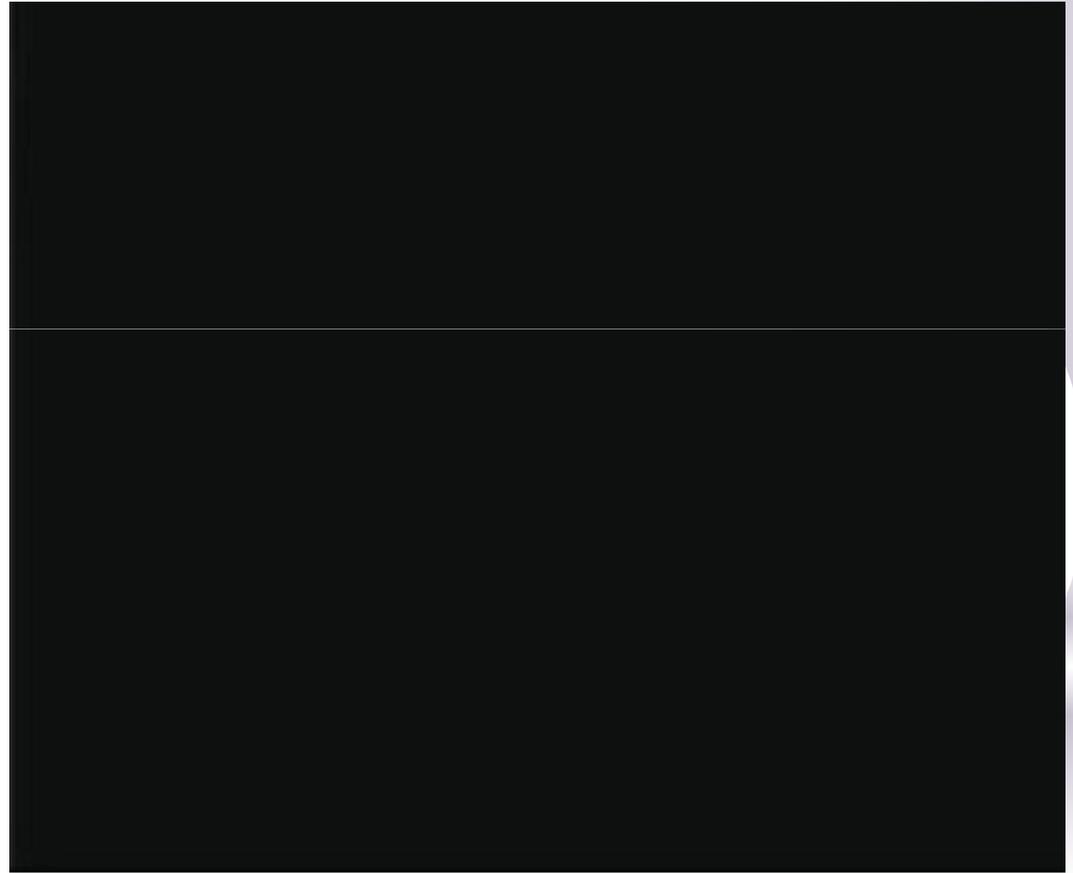
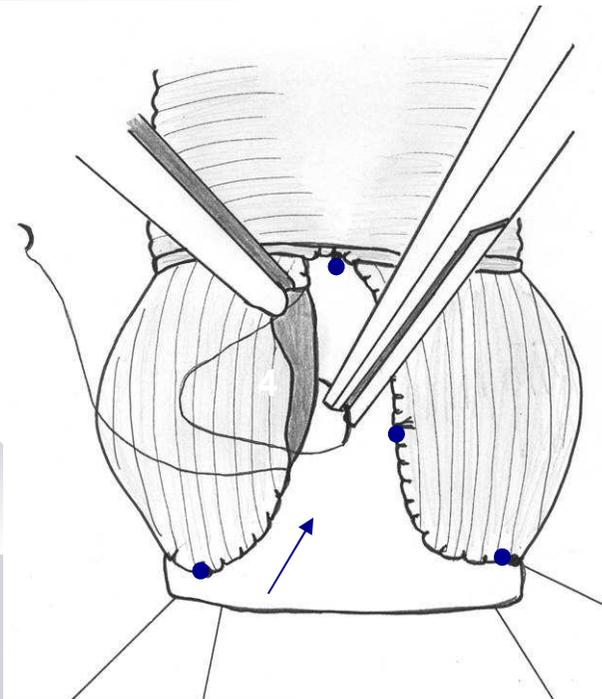
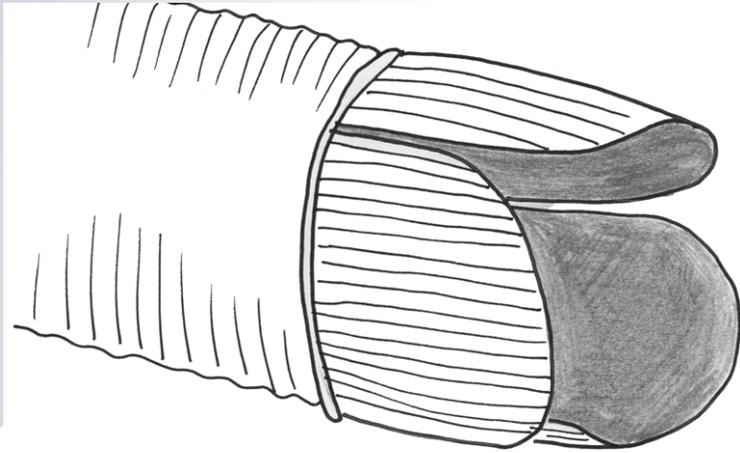


# 3. Inspection des lésions valvulaires

Alignement des longueurs de bords libres avant Remodeling

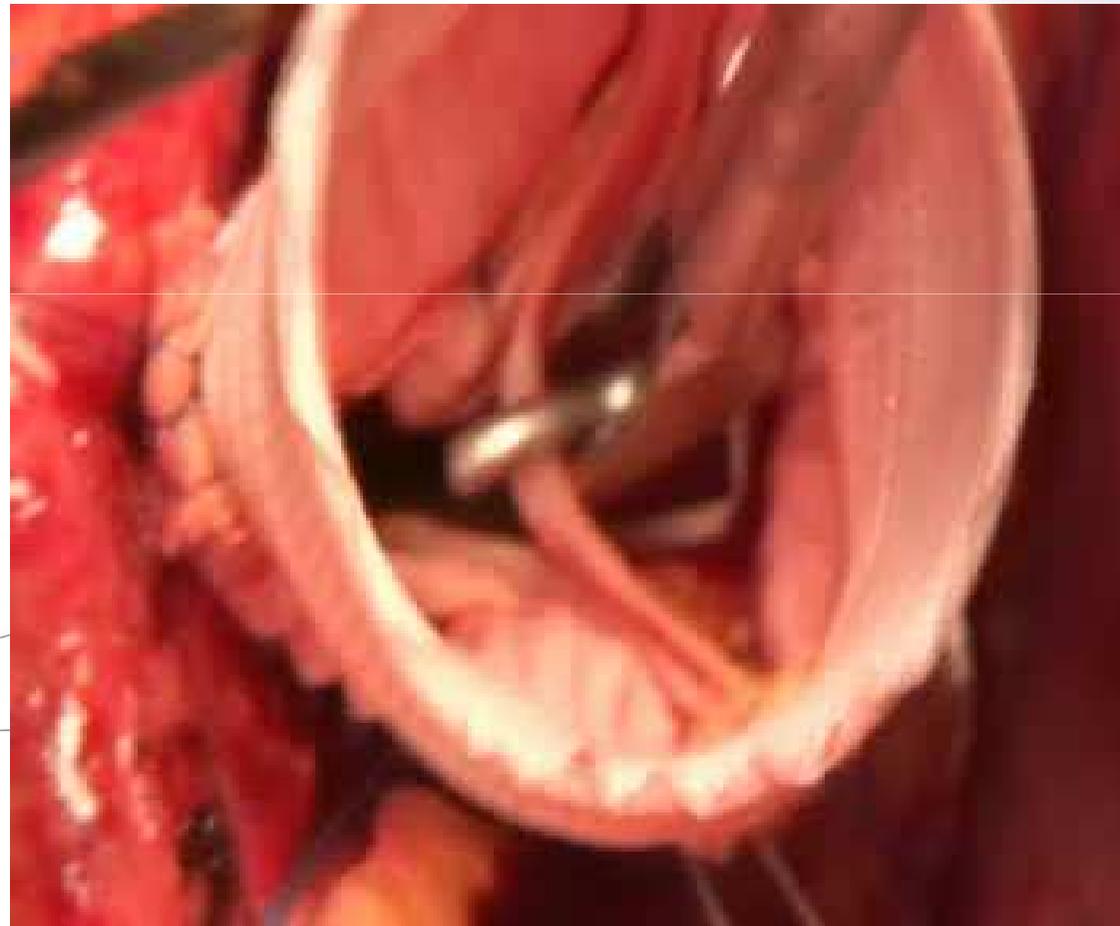
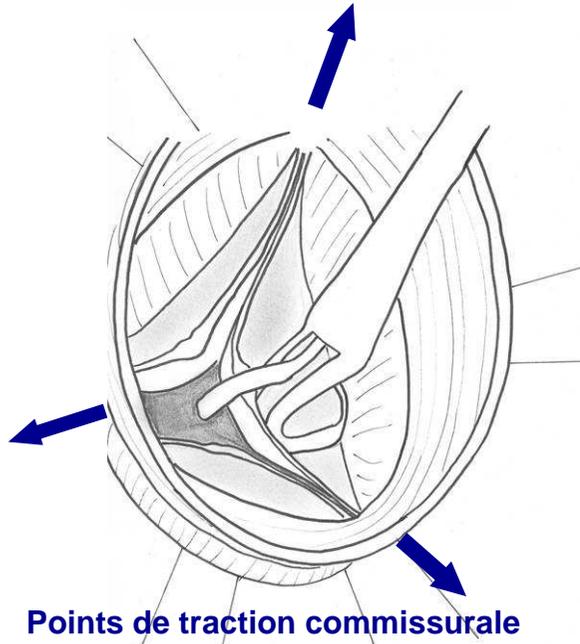
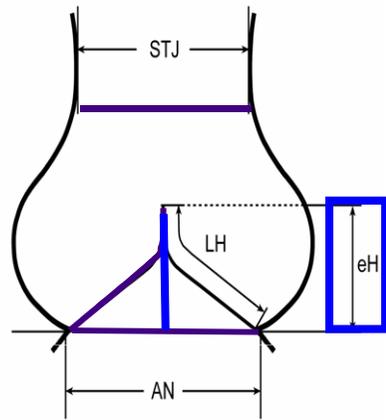


# 4. Remodeling de la racine

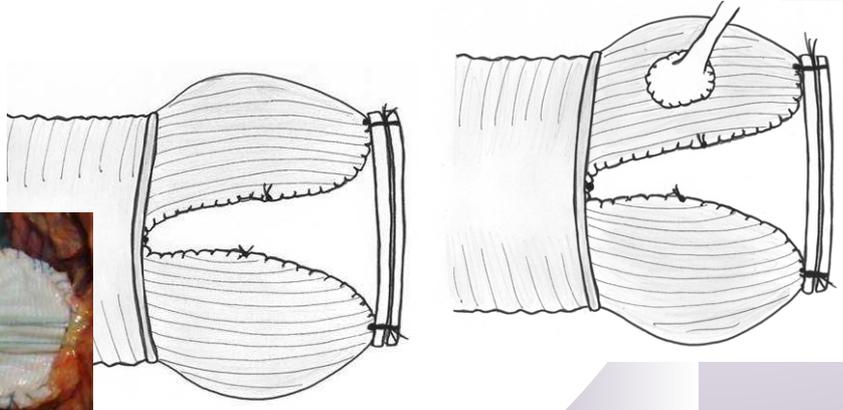
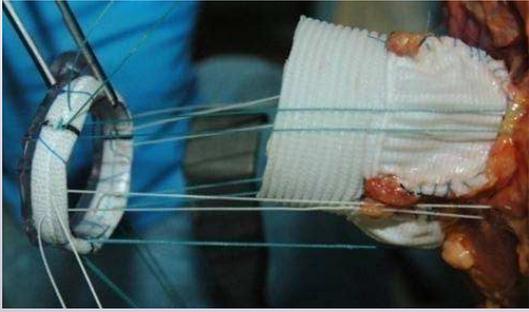


# 5. Resuspension valvulaire après Remodeling (Hauteur effective $\geq 9$ mm)

Schäfers et al., JTCVS 2006



# 6. Implantation de l'anneau expansible sous-valvulaire



\* Fuite centrale minime

\* Eh: 11 mm

\* Cl: 5 mm



photos 3 1223.MOV

\* **ECHO POST-OP**

\* Conclusion / discussion

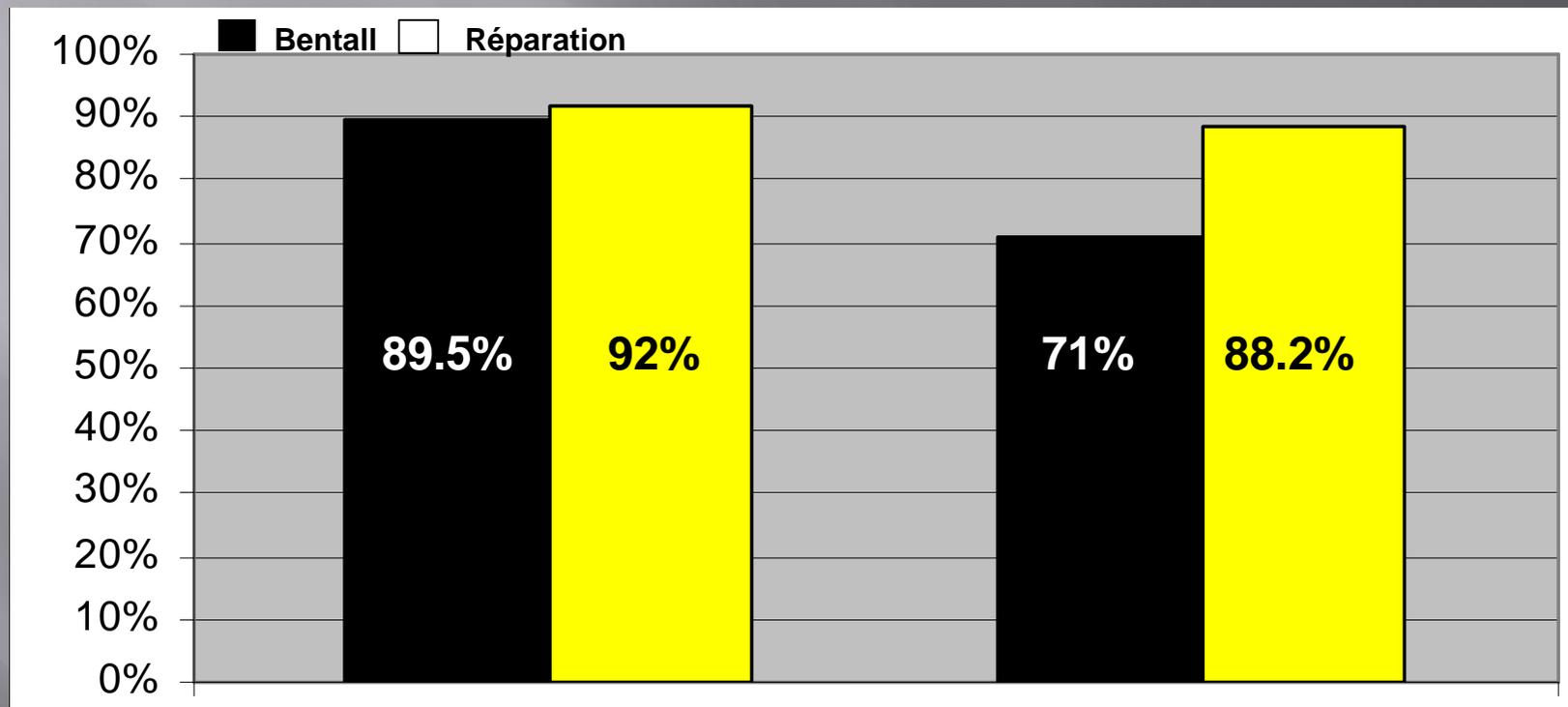
\* Résultats ...

# Bentall/Réparation valvulaire

(6 séries, 2001-2008)

Indemnité de réopération

Survie



La qualité de vie après Bentall est altérée par:

Réparations groupe Bentall : Endocardites, dégénérescences ou thrombooses de valves

- Bruit lié à la valve

- Nécessité d'un traitement anticoagulant

Réparations groupe réparation valvulaire = prolapsus valvulaire résiduel

- Peur d'une détérioration de la valve

# Quality of life: Bentall vs V sparing

The QoL was compromised for Bentall patients, in relation to all criteria of the 36-Item Short Form Health Survey.

40 to 60 % of patients feeled moderately or severely disturbed by valve noise in Bentall group

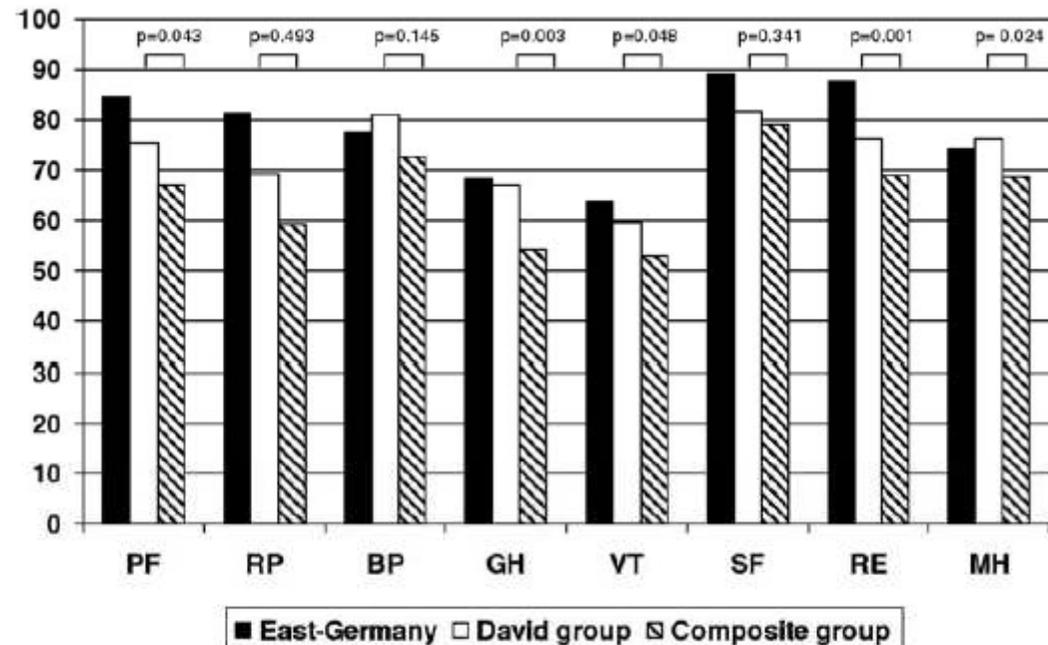


Fig 2. Quality of life data compared with the average findings for the East German population. Both the David and composite groups were compared using the unifactorial analysis of variance. Standard deviation is stated in the text. (BP = bodily pain; GH = general health; MH = mental health; PF = physical functioning; RE = role emotional; RP = role physical; SF = social function; VT = vitality.)

# Chirurgie des anévrismes de la racine

		<b>Total Bentall</b> (12 séries, 1999-2009)	<b>Total réparation valvulaire</b> (30 séries, 1997-2009)
<b>N</b>		<b>4500</b>	<b>3177</b>
<b>Age</b>		<b>51.8 ans</b>	<b>47 ans</b>
<b>Marfan</b>		<b>15.8% (1-46)</b>	<b>37% (0-68)</b>
<b>Bicuspidie</b>		<b>24.1% (2.5-46)</b>	<b>18.2% (0-36.4)</b>
<b>Mortalité élective</b>		<b>4.2% (0.6-7.1)</b>	<b>1% (0-9)</b>
<b>Suivi moyen</b>		<b>5.3 ans (3.6-8.8)</b>	<b>3.2 ans (1-5.6)</b>
<b>Indemnité réopération</b>		<b>90.2% 10 ans (76.5-98.8)</b>	<b>91.4% 10 ans (87-97)</b>
<b>Indemnité TE</b>		<b>91.3% 10 ans (80-95.8)</b>	<b>98.7% 10 ans (95-100)</b>
<b>Indemnité hémorragies</b>		<b>91.1% 10 ans (83-95.8)</b>	<b>99.9% 10 ans (99.4-100)</b>
<b>Survie</b>	<b>5 ans</b>	<b>82.8 % (74-95)</b>	<b>90.2% (82-96)</b>
	<b>10 ans</b>	<b>72.8% (62-85)</b>	<b>89.5% (80.4-96)</b>

# Résultats de la réparation valvulaire

	<b>Anévrismes de la racine</b> (19 séries, 2001-2009)	<b>Insuffisances aortiques isolées</b> (6 séries, 1997-2009)	<b>Bicuspidies</b> (5 séries, 1999-2009)
<b>N</b>	<b>2328</b>	<b>411</b>	<b>438</b>
<b>Age</b>	<b>47.7 ans (29.2-60)</b>	<b>51.3 ans (34-60)</b>	<b>42 ans (38-43)</b>
<b>Marfan</b>	<b>37% (0-68)</b>	<b>0</b>	<b>-</b>
<b>Bicuspidie</b>	<b>11.3% (0-36.4)</b>	<b>25.2% (3.3-41)</b>	<b>-</b>
<b>Mortalité électorale</b>	<b>1.7% (0-9)</b>	<b>0.9% (0-2.4)</b>	<b>0.4% (0.1-2)</b>
<b>Suivi moyen</b>	<b>3.2 ans (1-5.6)</b>	<b>2.7 ans (1.1-4.5)</b>	<b>3.7 ans (2.5-5)</b>
<b>Indemnité de réopération</b>	<b>92.1% 10 ans (87.1-96)</b>	<b>90.1% 5 ans (87-96)</b>	<b>92% 5 ans (87-97)</b>
<b>Indemnité TE</b>	<b>98.7% 10 ans (95-100)</b>	<b>98% 5 ans</b>	<b>100 % 4 ans</b>
<b>Indemnité Hémorragie</b>	<b>99.9% 10 ans (99.4-100)</b>	<b>97% 5 ans (94-100)</b>	<b>100% 4 ans</b>
<b>Survie</b>	<b>5 ans</b>	<b>91.8% (87-96)</b>	<b>87.3% (82-92)</b>
	<b>10 ans</b>	<b>90.2% (80.4-96)</b>	<b>-</b>
			<b>98.3% 4 ans (97-100)</b>