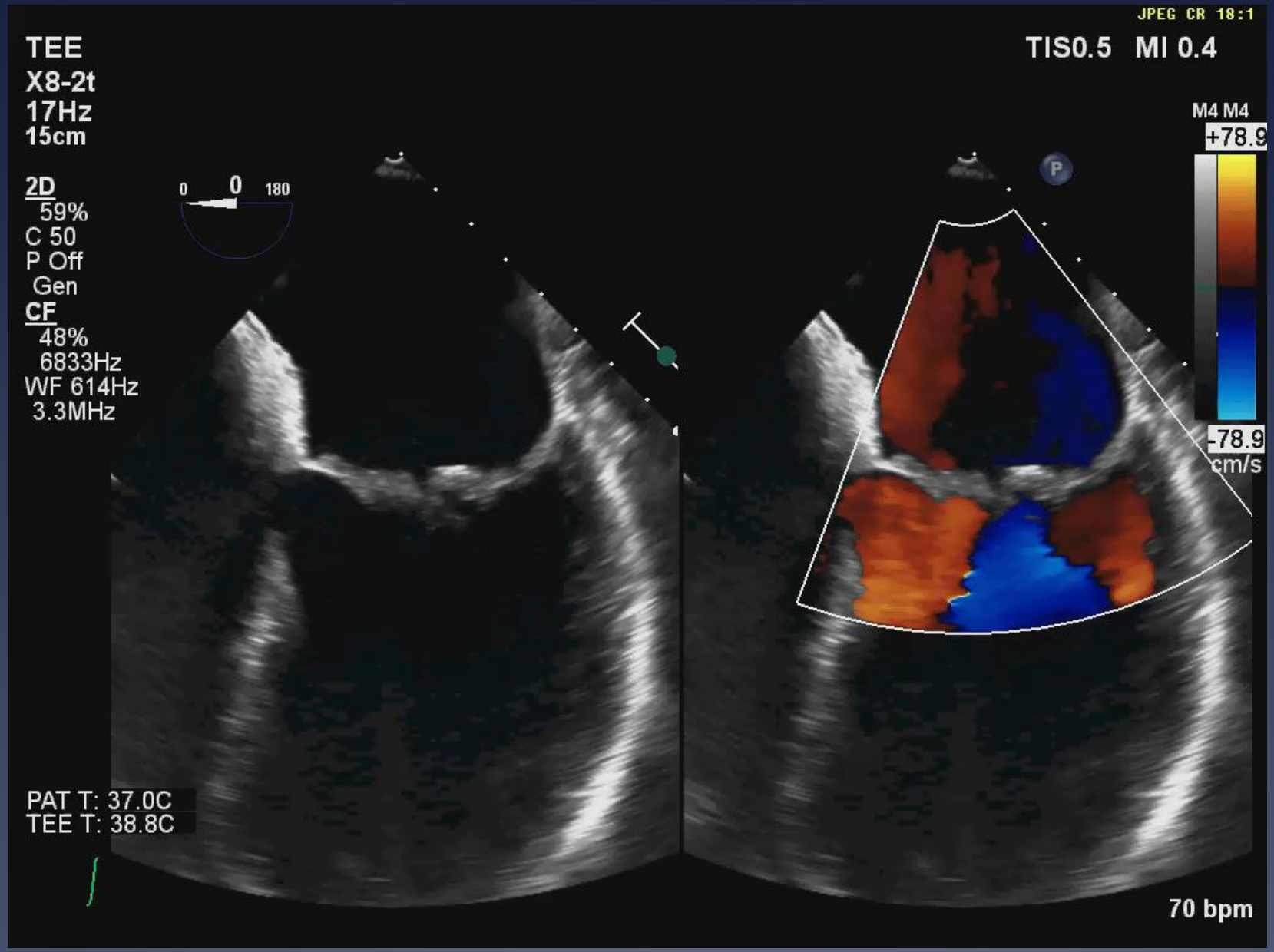
Aortic Regurgitation Remains off-Limits For TAVI

Cliniques Universitaires Saint-Luc, Brussels Belgium

Gebrine El Khoury MD, PhD

WHO WOULD **NOT** REPAIR THIS VALVE?



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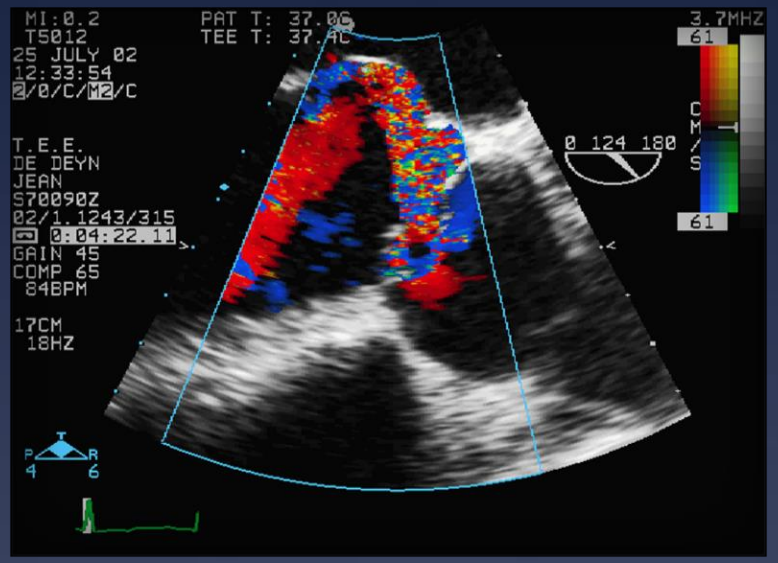
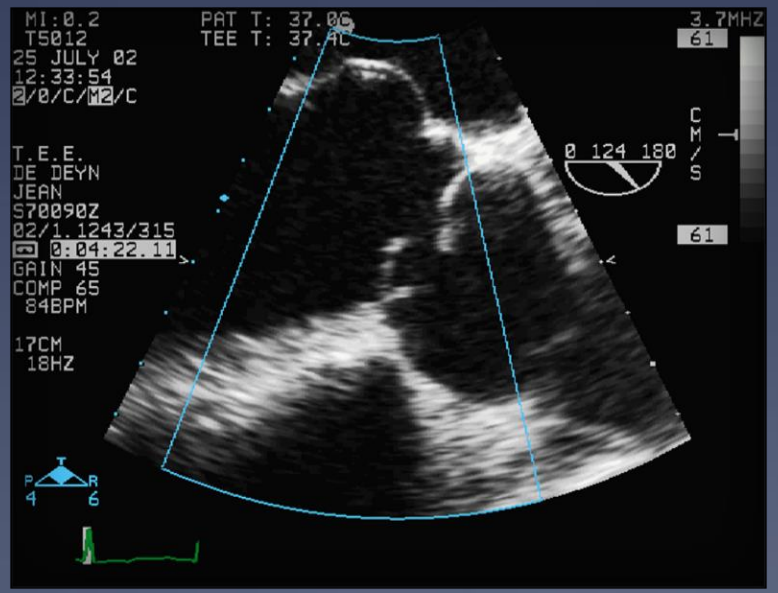
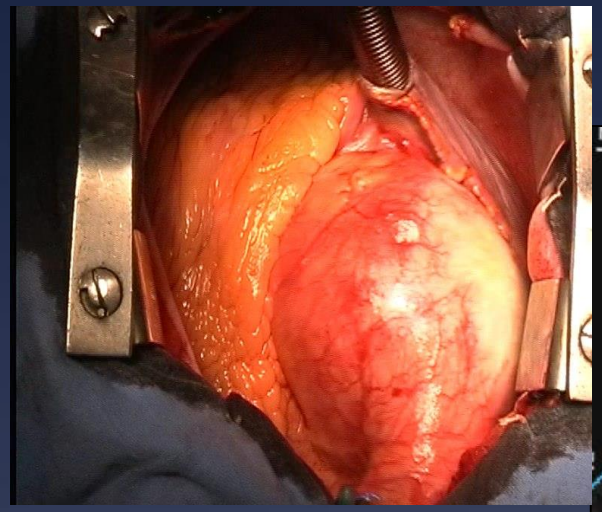
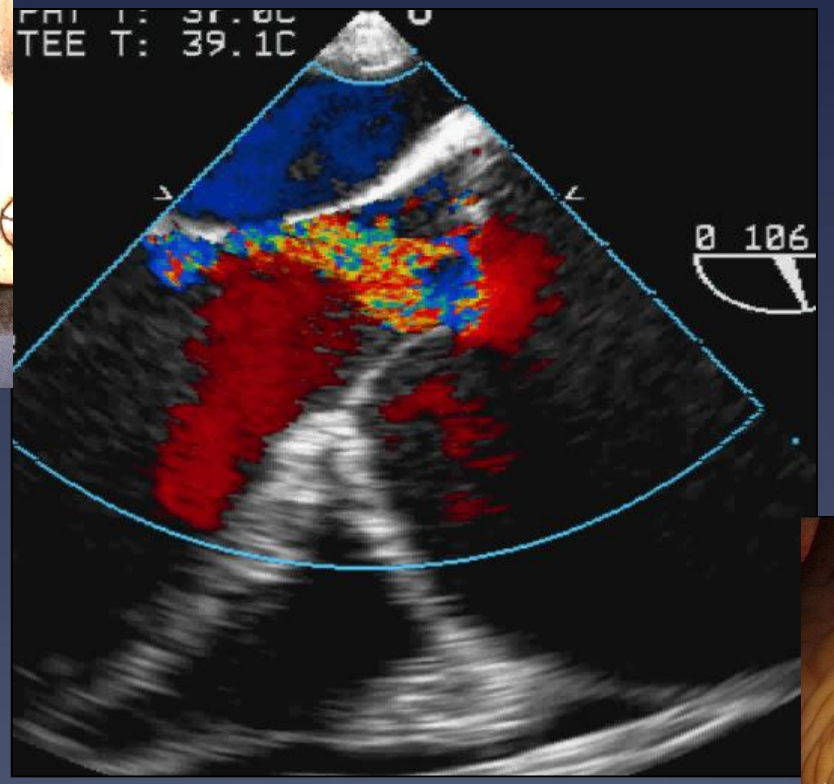
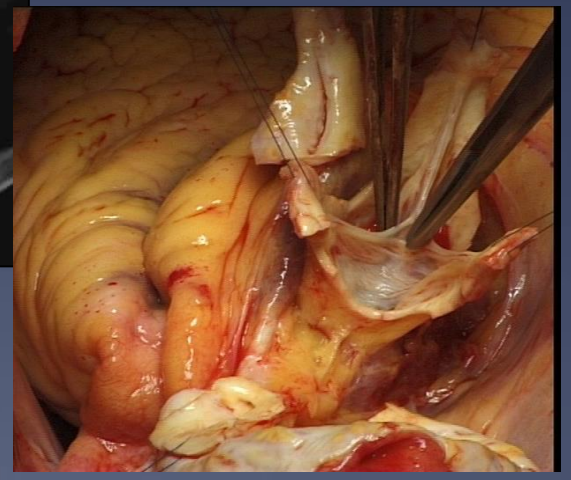


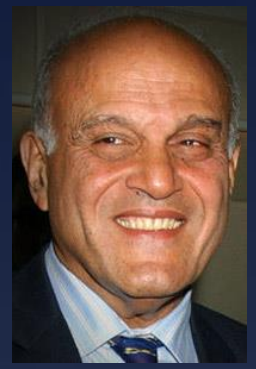


1st important observation: root/ascending aorta aneurysm may induce AR despite normal AV leaflets





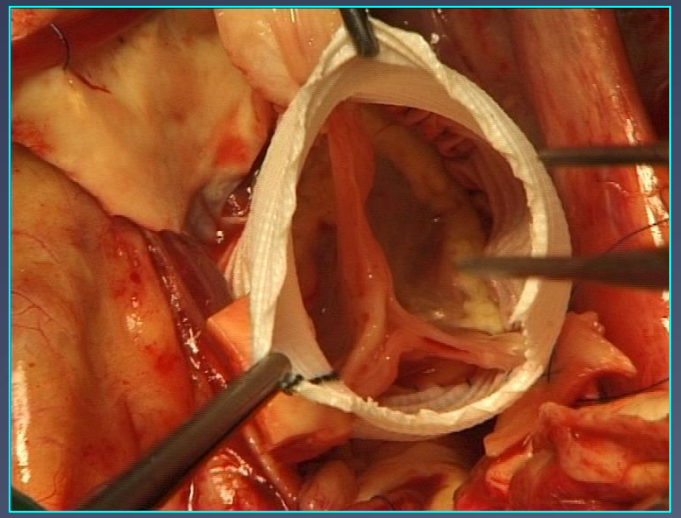


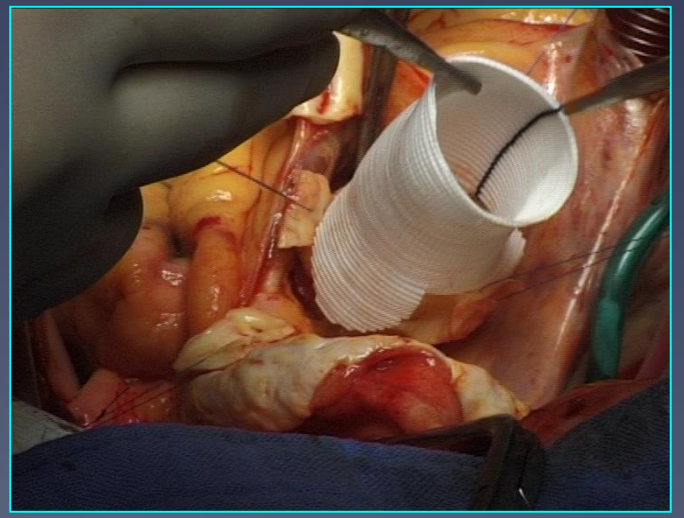


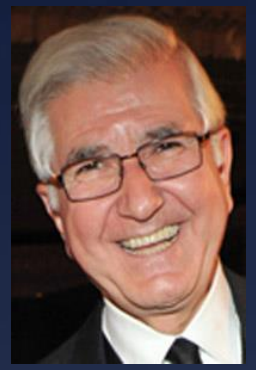
Sir M Yacoub (1993): remodeling of the aortic annulus

JTCVS 1993; 10 cases 1982-1990

*« Isolated aortic valve regurgitation that results from disease that **primarly** affects the aortic wall can be repaired by remodeling of the **aortic anulus** to restore its normal geometry…*
*increases in the **surface area** of the leaflet that are caused by **root dilatation** are often present and can be accomodated in the repair procedure »*



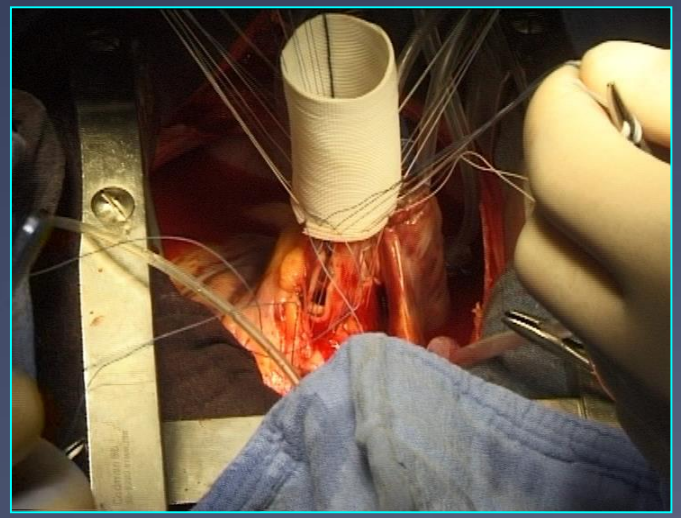


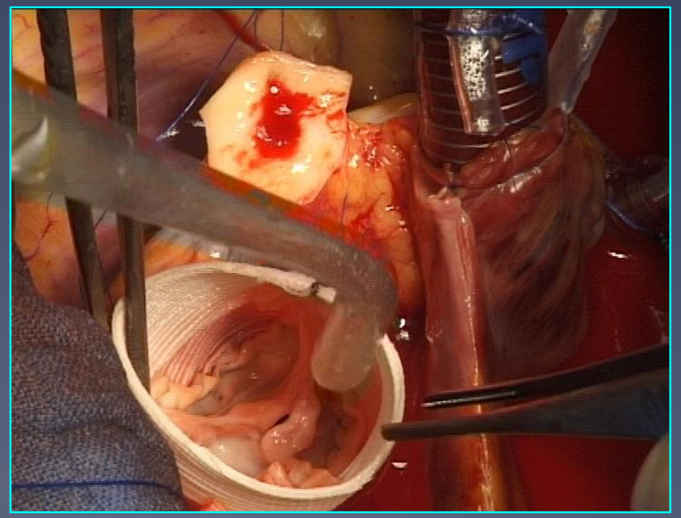


Dr. T David (1992): reimplantation of the aortic valve

JTCVS 1992 (10 patients 1988-1992);

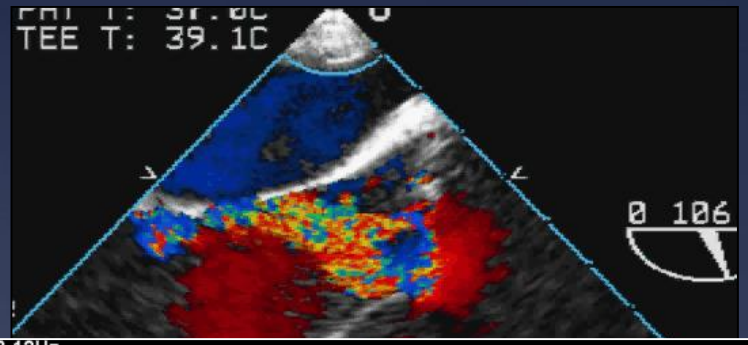
"A number of patients who require an operation for complications of annuloaortic ectasia, such as aortic incompetence or aneurysm of the aortic root (or both), have ***normal aortic valve leaflets****.*
We have treated these patients by excising the aneurysmal portion of the ascending aorta and sinuses of Valsalva... The aortic valve is ***reimplanted*** *inside a collagen-impregnated tubular Dacron graft…"*

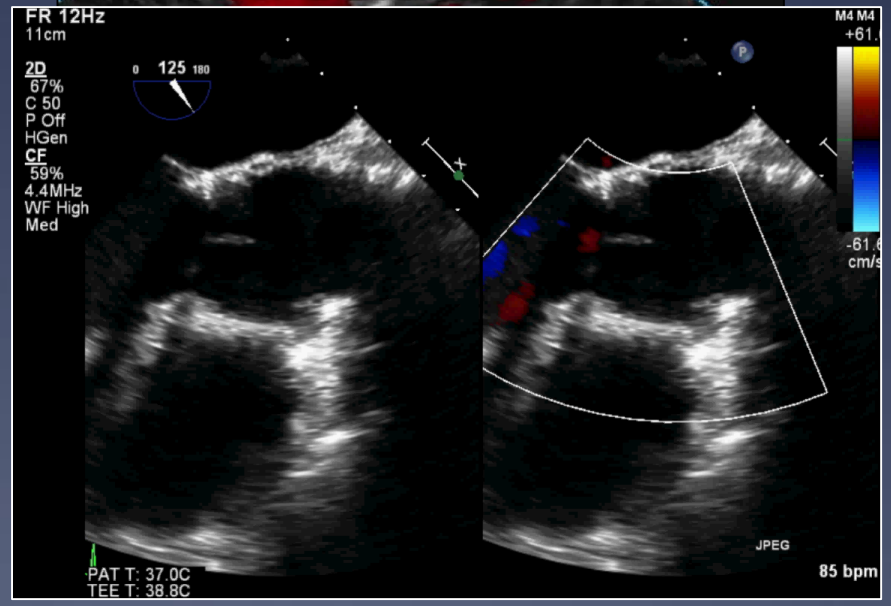


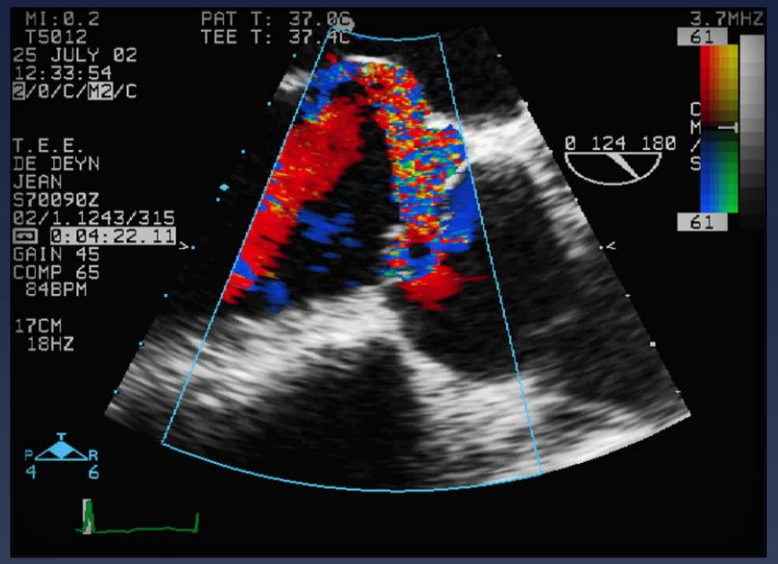


Restoration of the aortic root geometry with a graft restores a normal AV function

TREAT THE LESION, CORRECT THE DYSFUNCTION



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T5012
25 JULY 02
12:33:54
2/0/C/M2/C
PAT T: 37.0C
TEE T: 37.4C
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61
0 124 180
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61
T.E.E.
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JEAN
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GAIN 45
COMP 65
84BPM
17CM
18HZ
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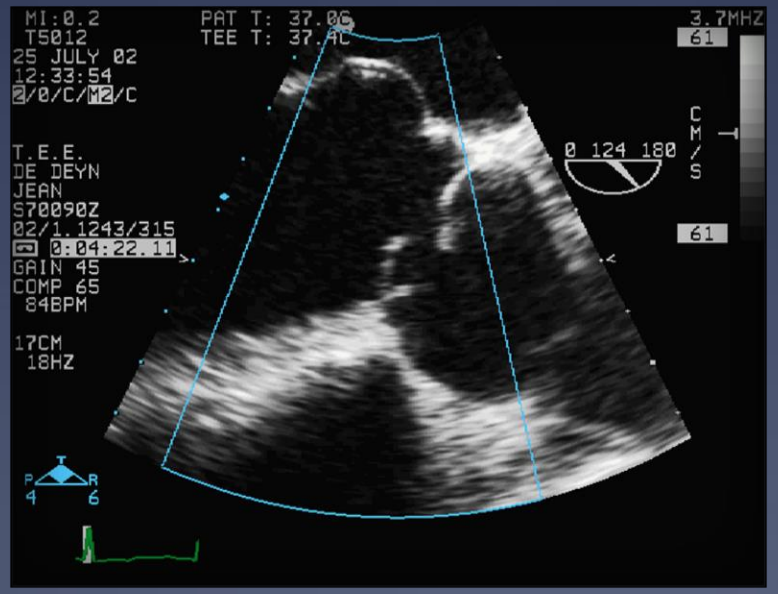
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GAIN 45
COMP 65
84BPM
17CM
18HZ
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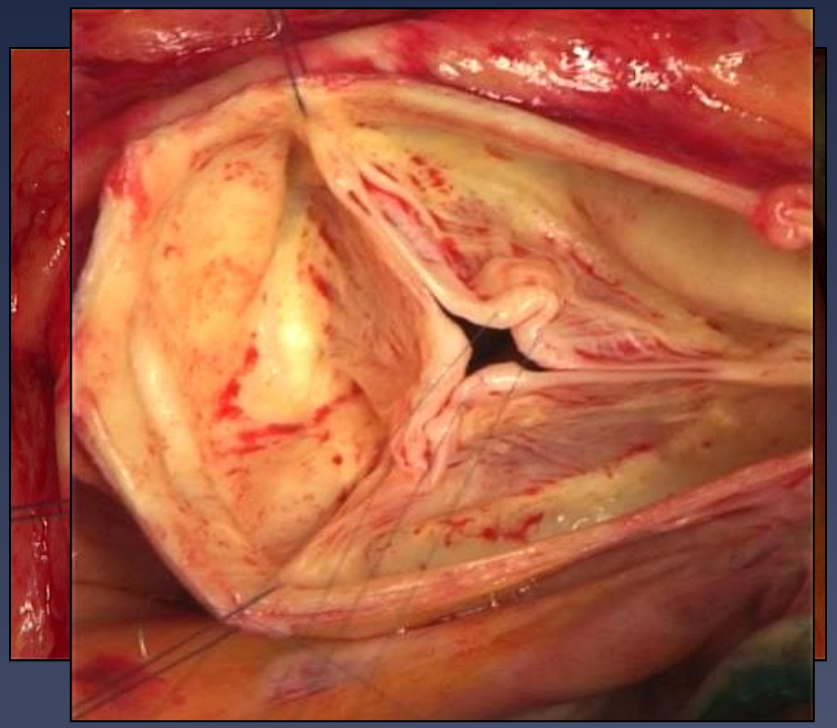
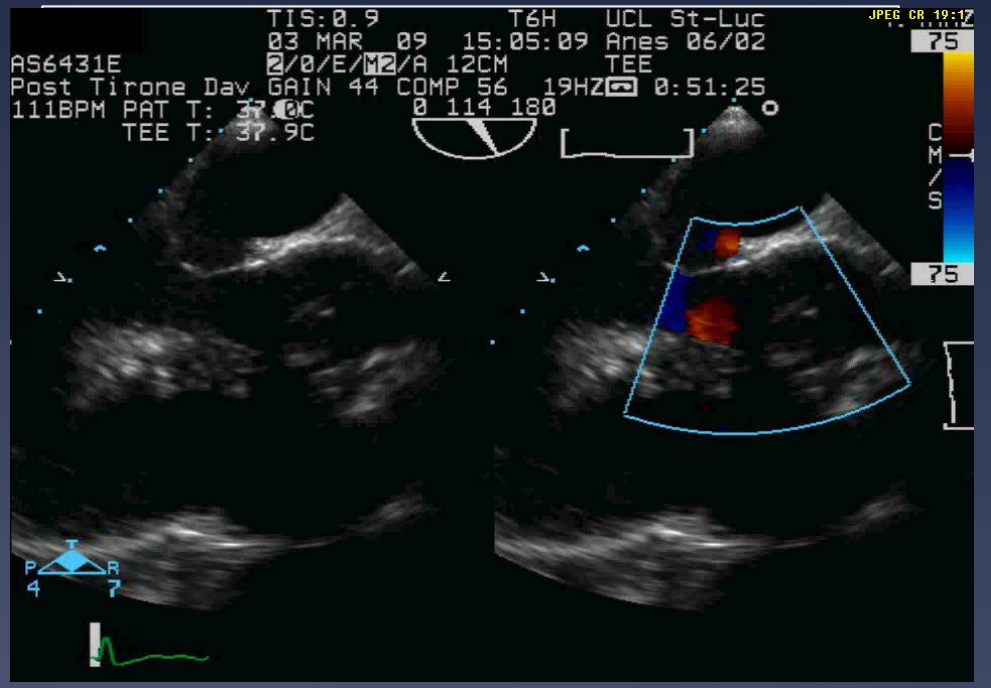
Dysfunctional Aortic Valve

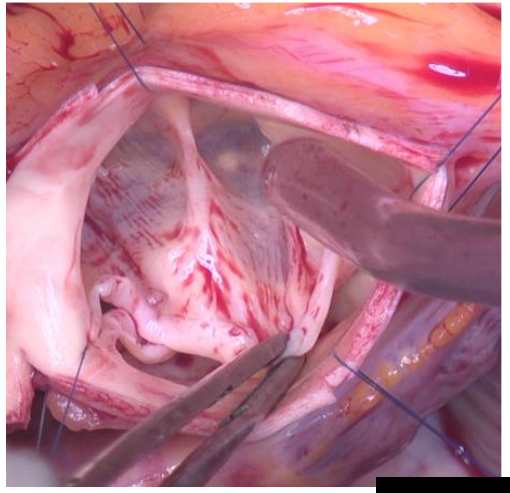
2nd important observation: we can have Aortic Insufficiency despite a normal size aorta and (almost) normal leaflets

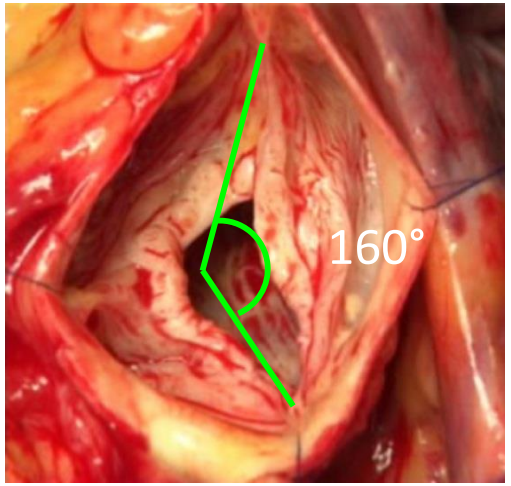


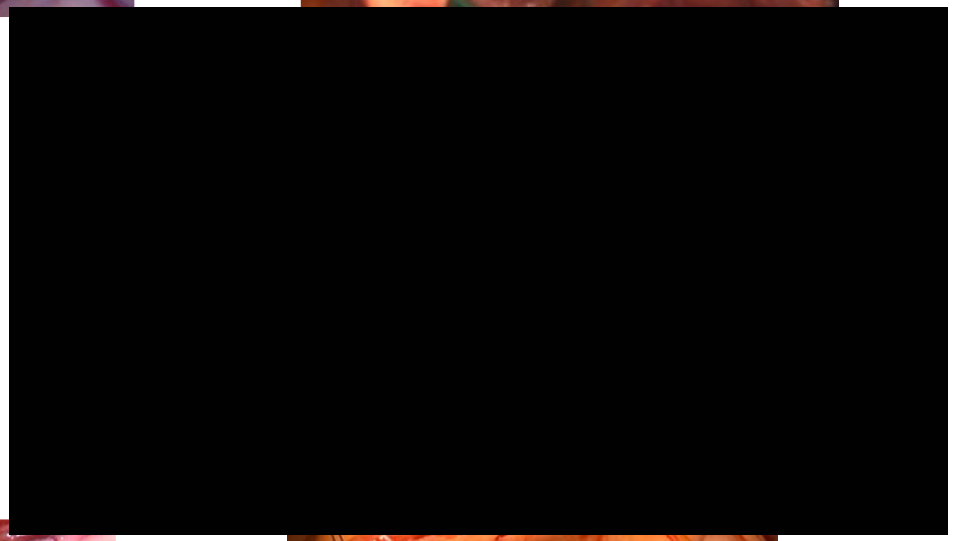


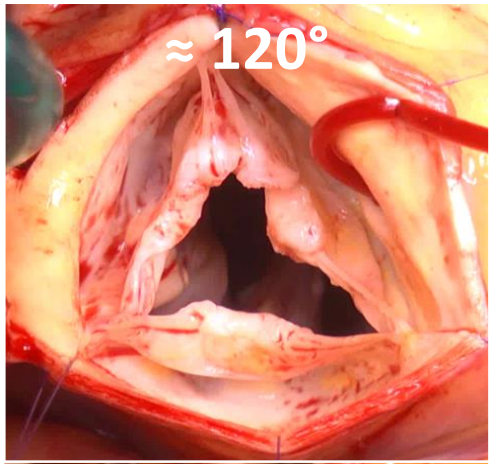
AV prolapse is an **elongation** of the cusp free margin; shortening of the free margin restores a normal function

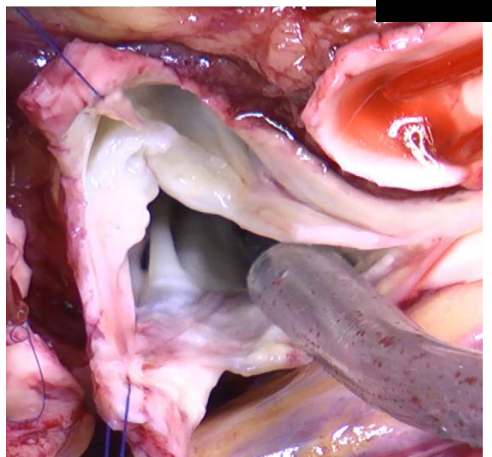
TREAT THE LESION, CORRECT THE DYSFUNCTION

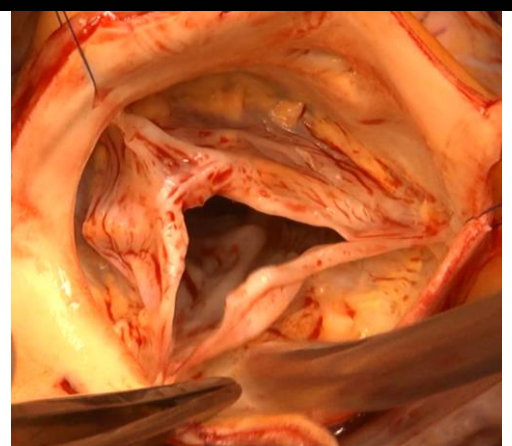


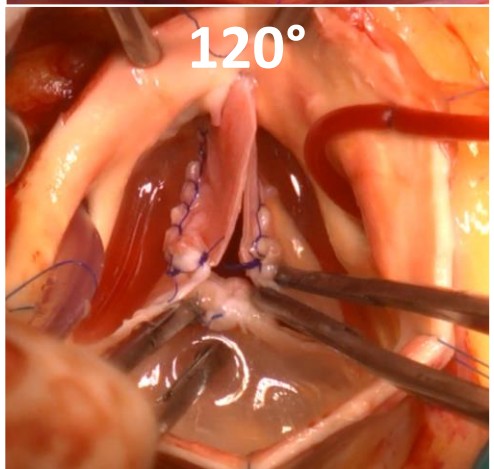

160°



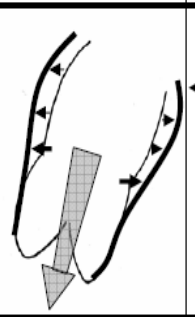
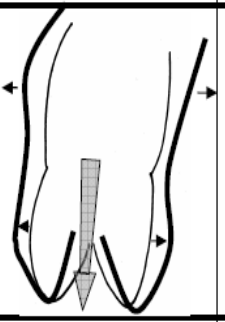
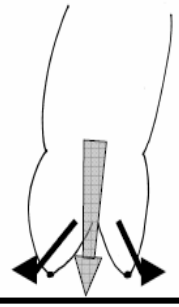
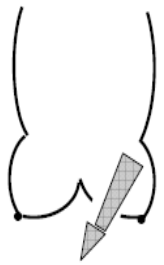
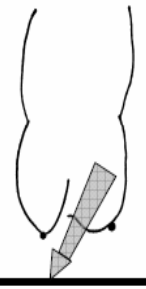
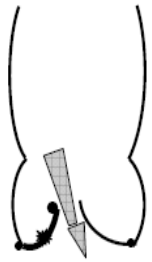

≈ 120°






120°

Functional classification of Aortic Regurgitation

AI Class	Type I Normal cusp motion with FAA dilatation or cusp perforation				Type II Cusp Prolapse	Type III Cusp Restriction
	Ia	Ib	Ic	Id		
Mechanism						
Repair Techniques (Primary)	STJ remodeling *Ascending aortic graft*	Aortic Valve sparing: *Reimplantation or Remodeling with SCA*	SCA	Patch Repair *Autologous or bovine pericardium*	Prolapse Repair *Plication* *Triangular resection* *Free margin Resuspension* *Patch*	Leaflet Repair *Shaving* *Decalcification* *Patch*
(Secondary)	SCA		STJ Annuloplasty	SCA	SCA	SCA

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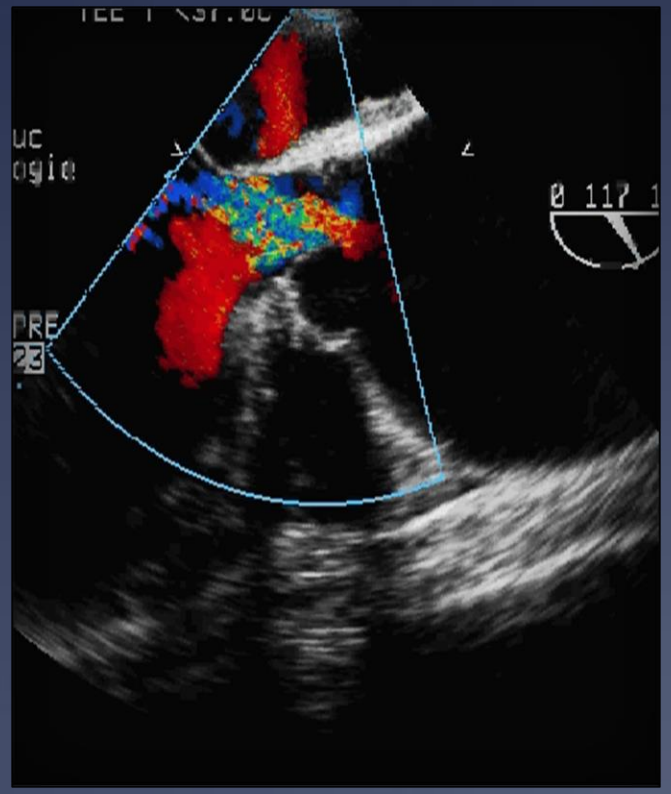
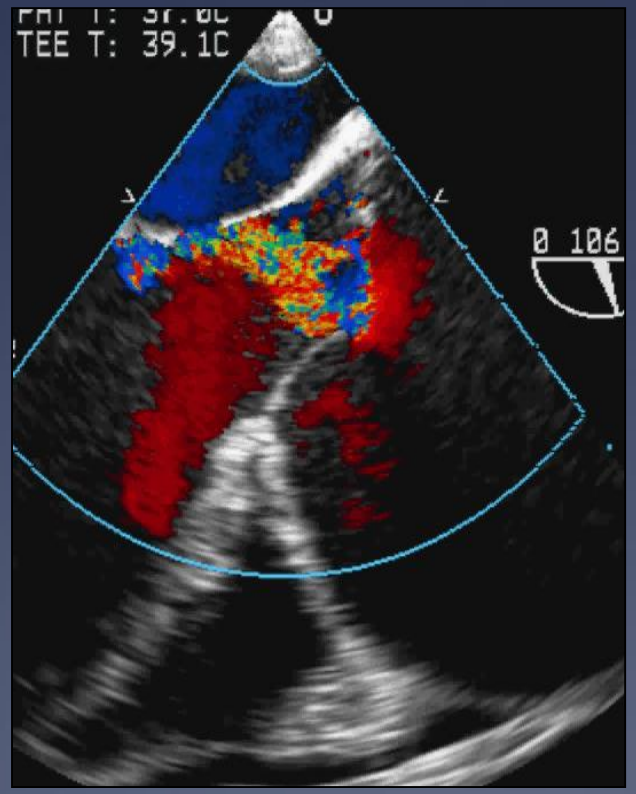
Functional classification of AI

Type 1: "FAA Dilatation"

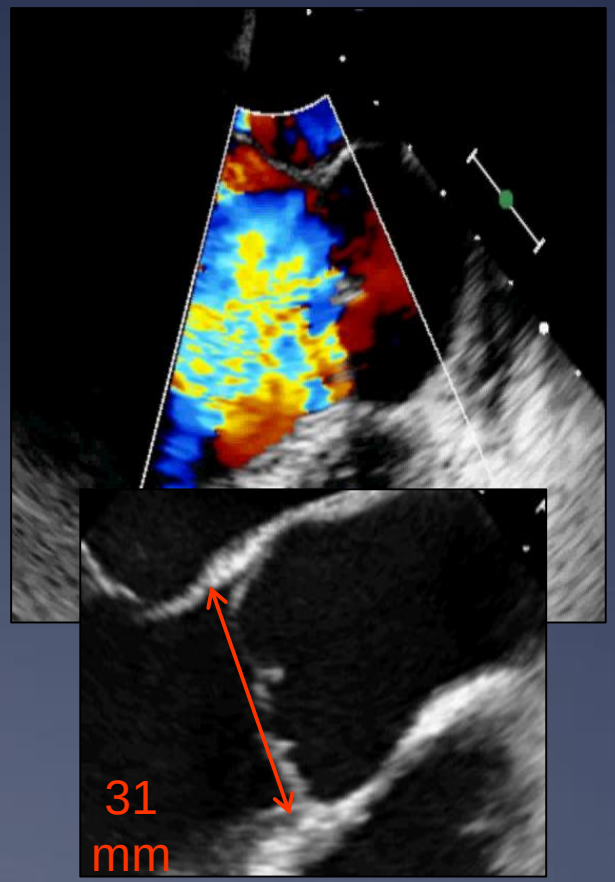
Type 1a
Asc. Ao. (STJ)



Type 1b
Root (STJ +VAJ)



Type 1c
VAJ

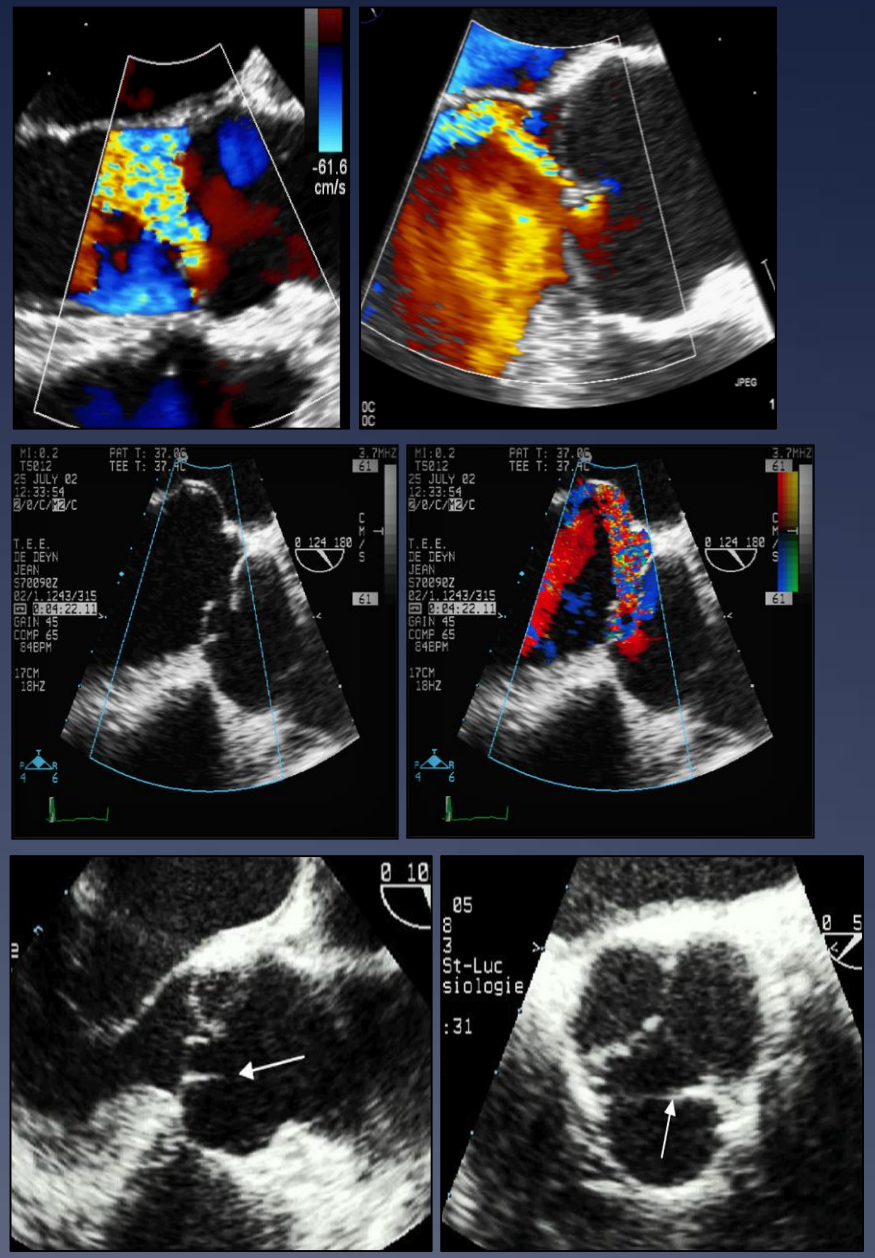


Functional classification of AI

Type 2: "*Prolapse*"

Eccentric jet

- ✓ Cusp billowing
- ✓ Transverse fold in cusp curvature

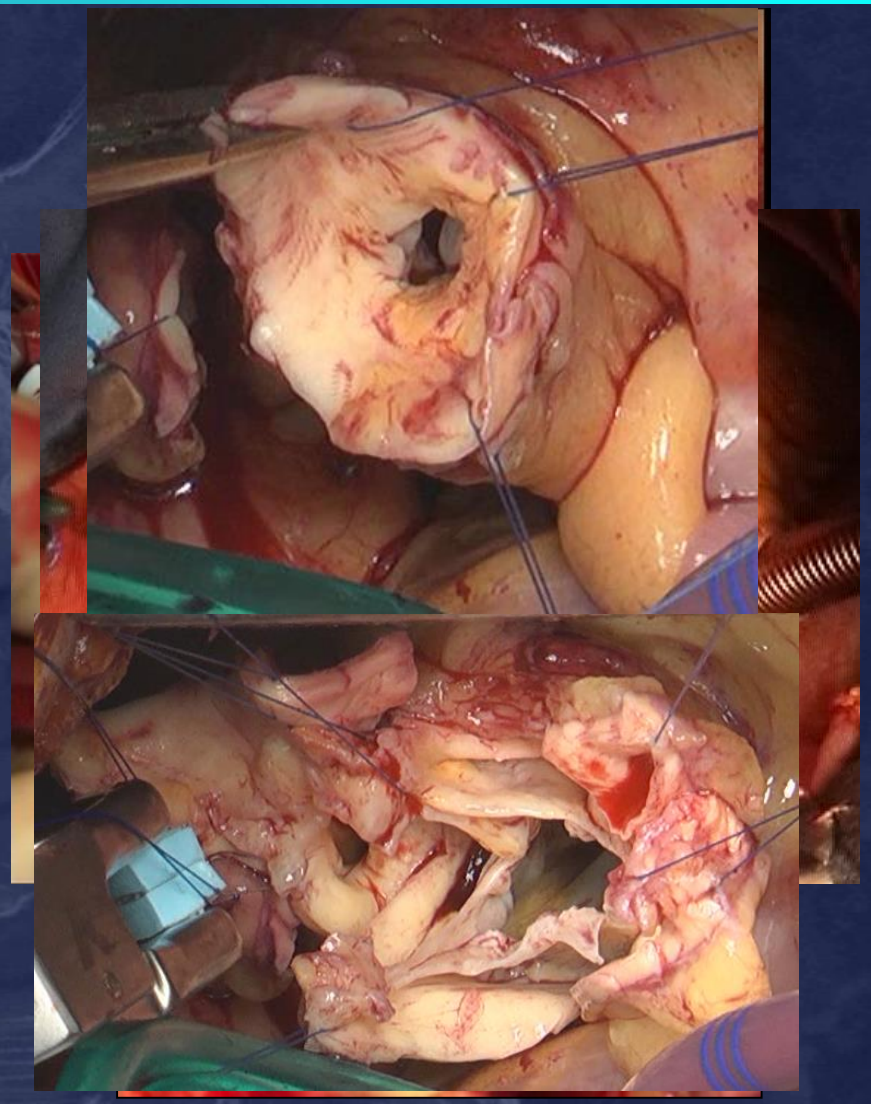


Pathologies amenable to AV repair

Aortic Regurgitation

1. Congenital/etiology

- Moncuspid
- Bicuspid
- Quadricuspid
- Connective tissue disorders (Marfan, Loeys-Dietz, Ehler-Danlos, Familial Aneurysmal disease, …)
- Supra-aortic stenosis

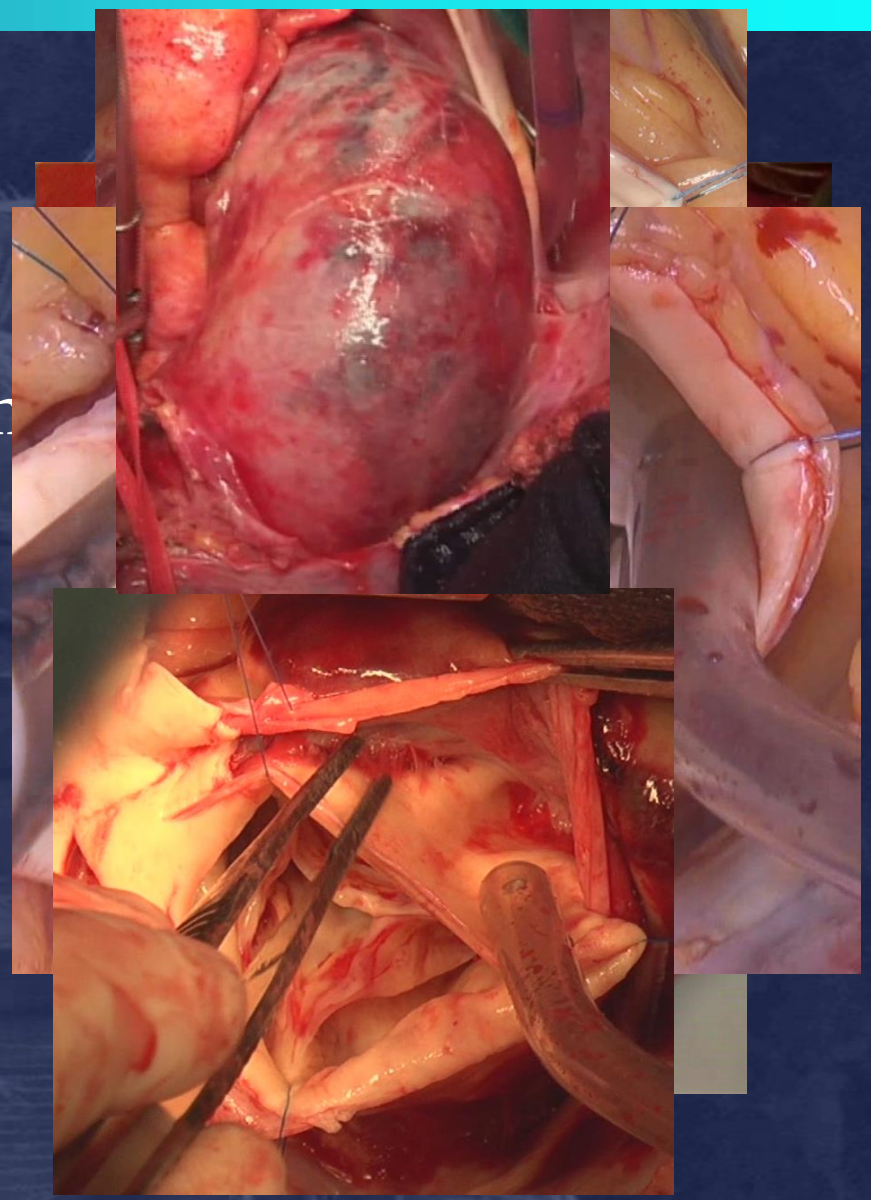


Pathologies amenable to AV repair

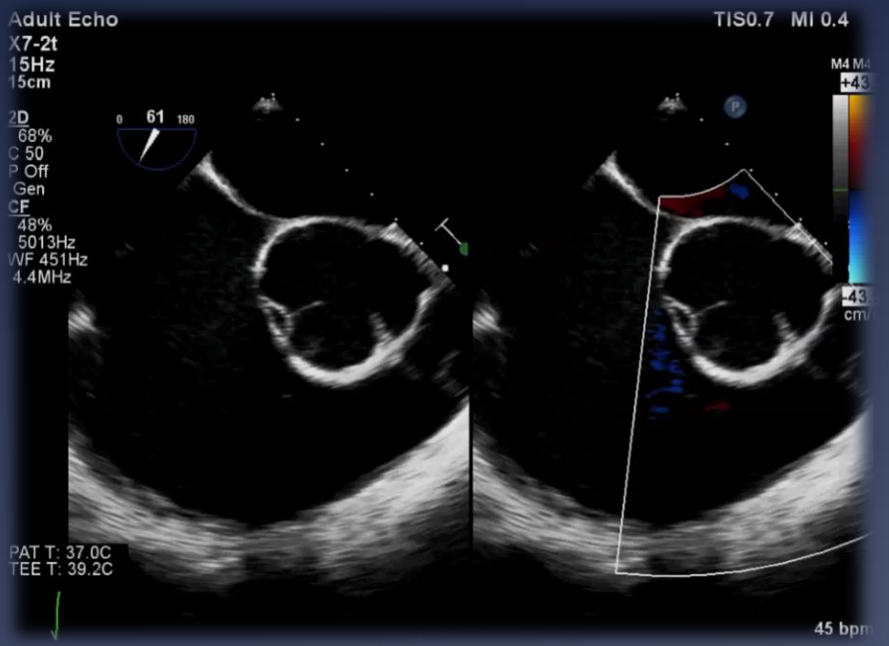
Aortic Regurgitation

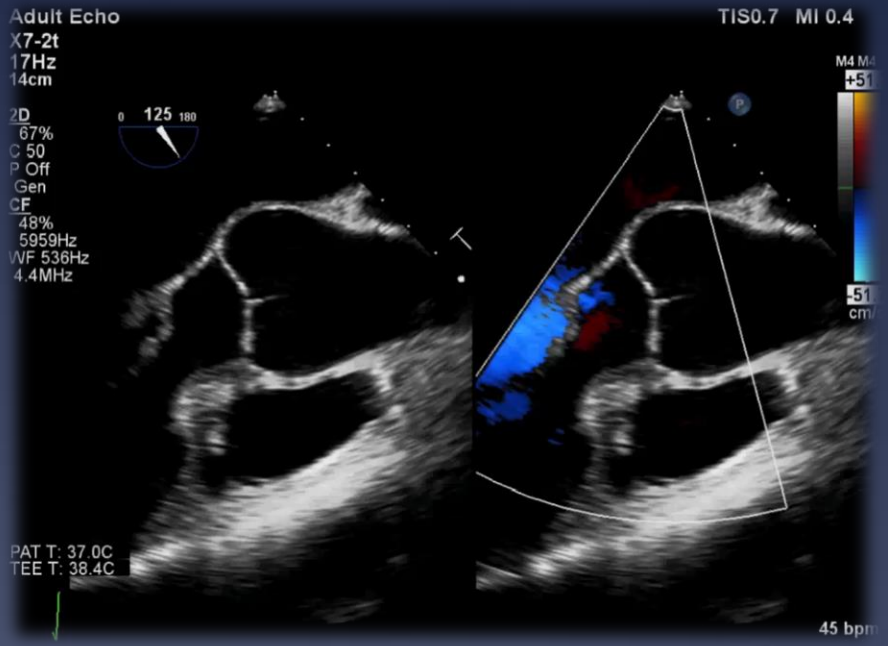
1. Acquired/etiology

- Degenerative cusp
- Degenerative aortic aneurysm (Atherosclerosis)
- Traumatic
- Infectious
- Acute aortic dissection

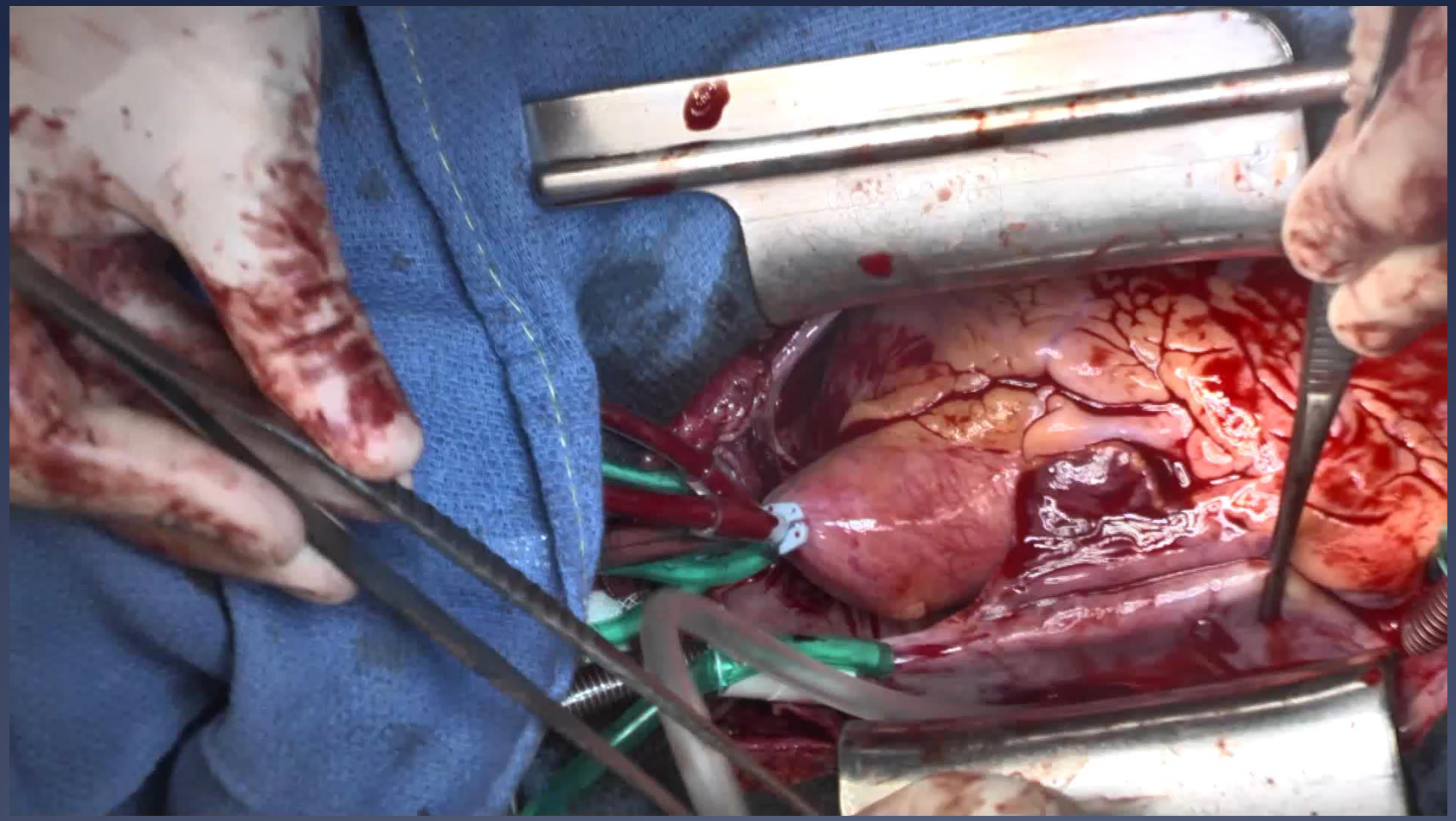


A Marfan patient: Preoperative TEE



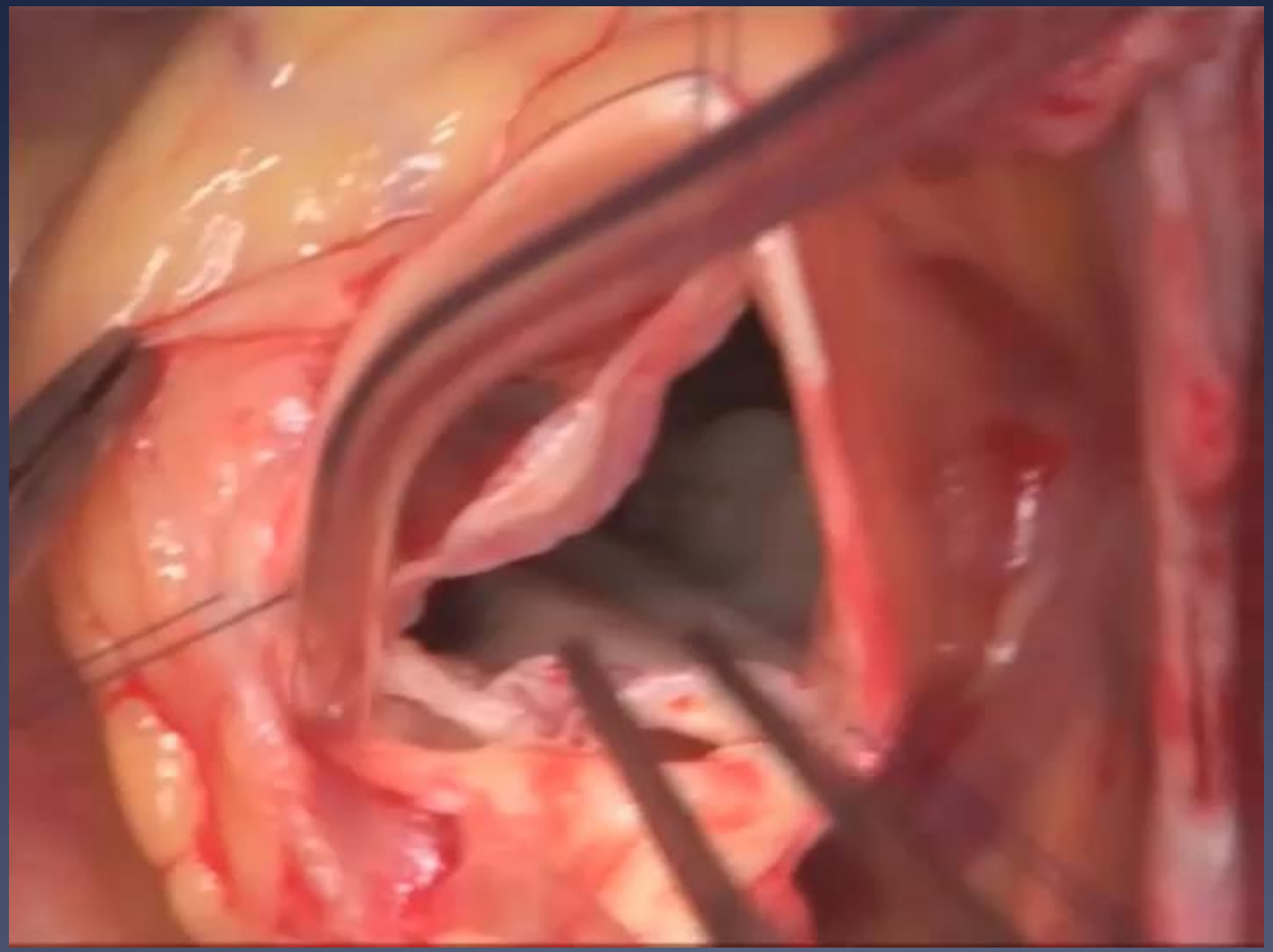


Marfan: Surgical Technique

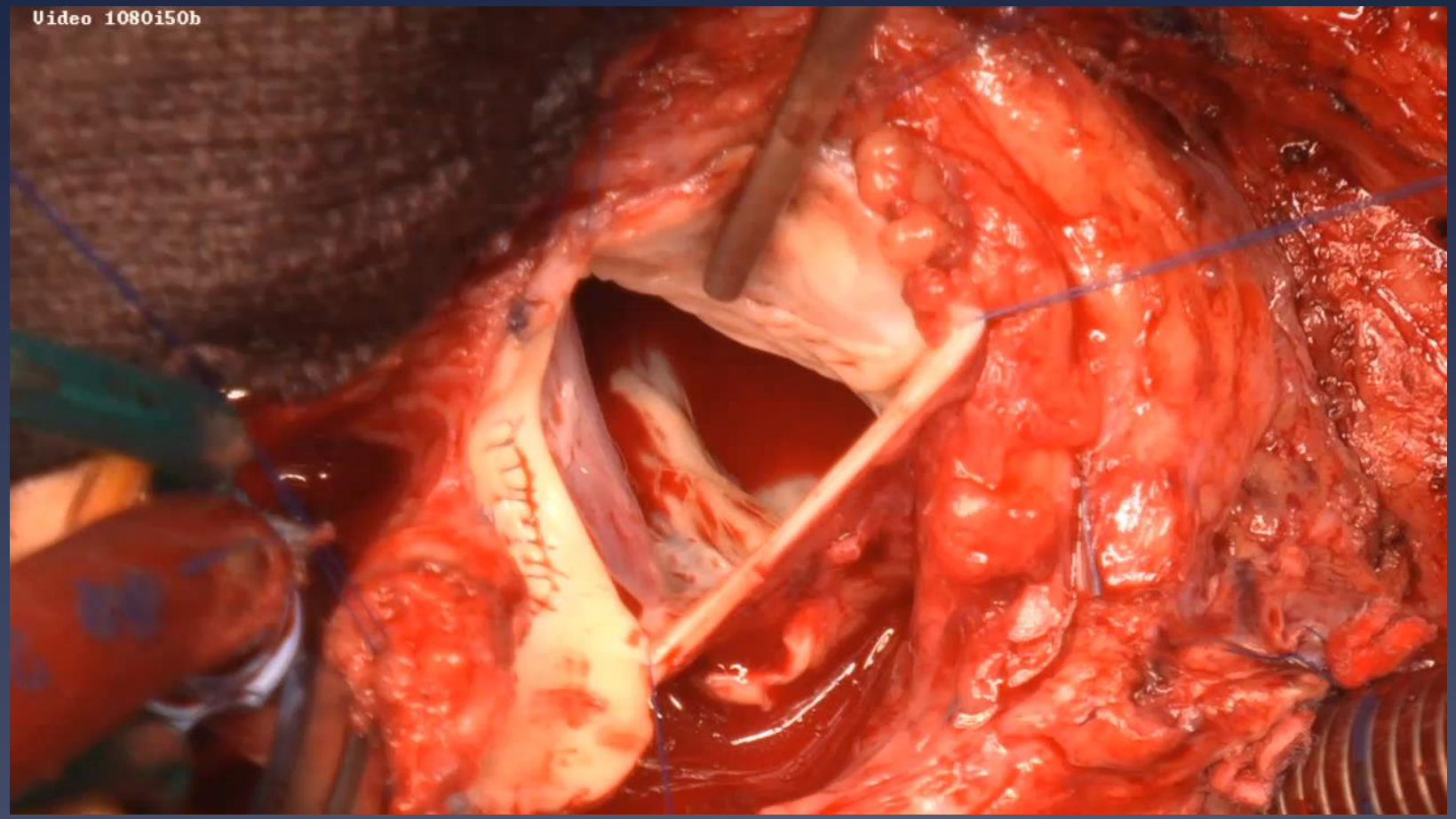


Bicuspid Aortic Pathology: Surgical Technique

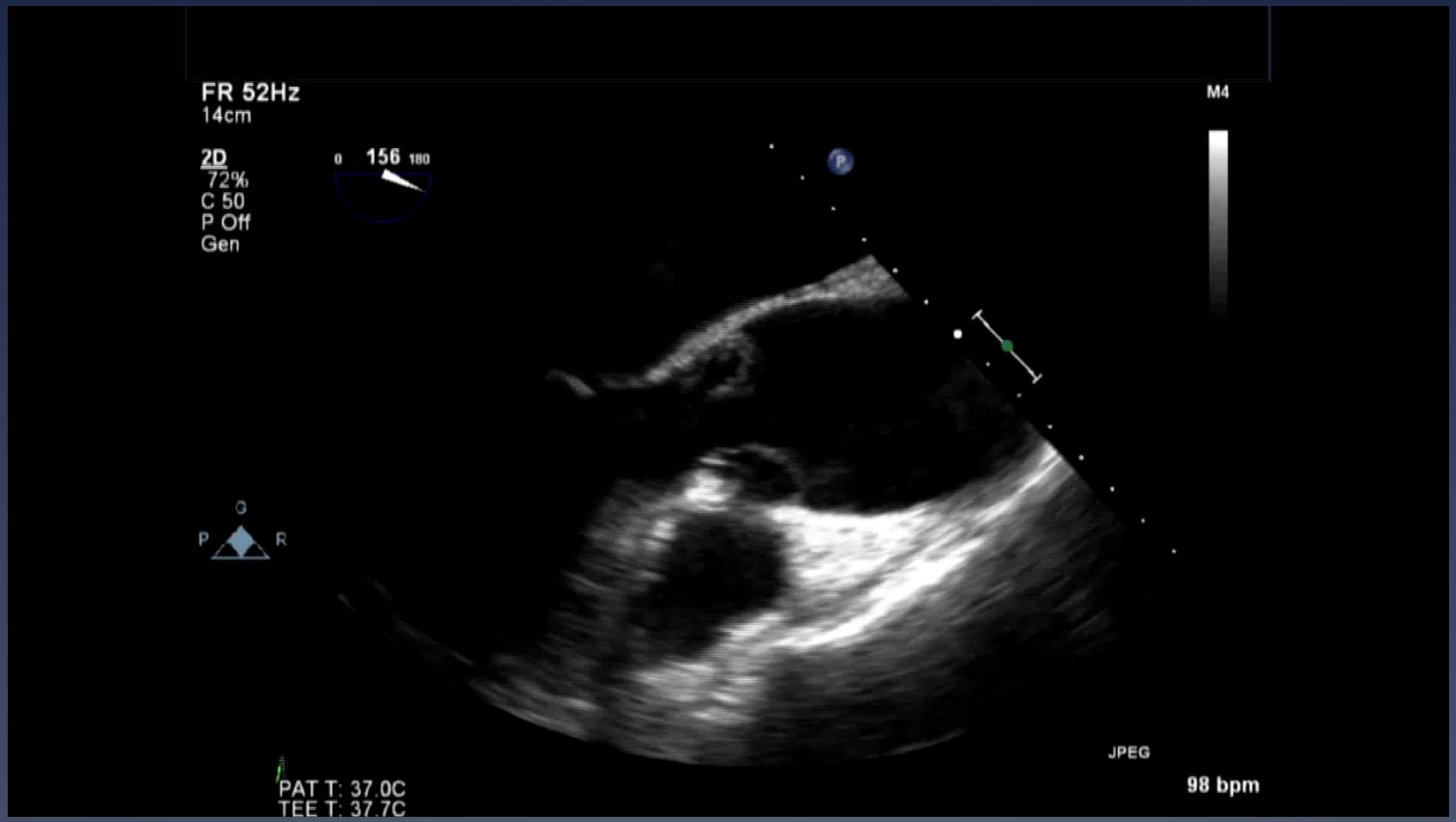
A Quadricuspid valve



Ross Reoperation : Surgical Technique



Aortic Dissection: Surgical Technique

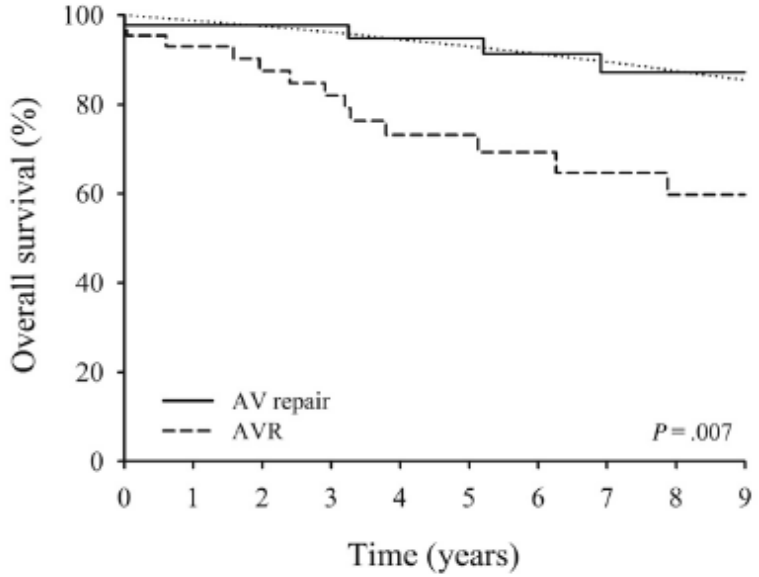


Valve repair improves the outcome of surgery for chronic severe aortic regurgitation: A propensity score analysis

Christophe de Meester, MS,[a,b] Agnès Pasquet, MD, PhD,[a,b] Bernhard L. Gerber, MD, PhD,[a,b] David Vancraeynest, MD, PhD,[a,b] Philippe Noirhomme, MD,[a,c] Gébrine El Khoury, MD,[a,c] and Jean-Louis J. Vanoverschelde, MD, PhD[a,b]

- 44 PS matched patients in each group (AV repair vs AV replacement)
- Operated for severe AI between 1995-2012
- Mean age: 65 in both groups
- Mean follow-up 6.8±4.7 years

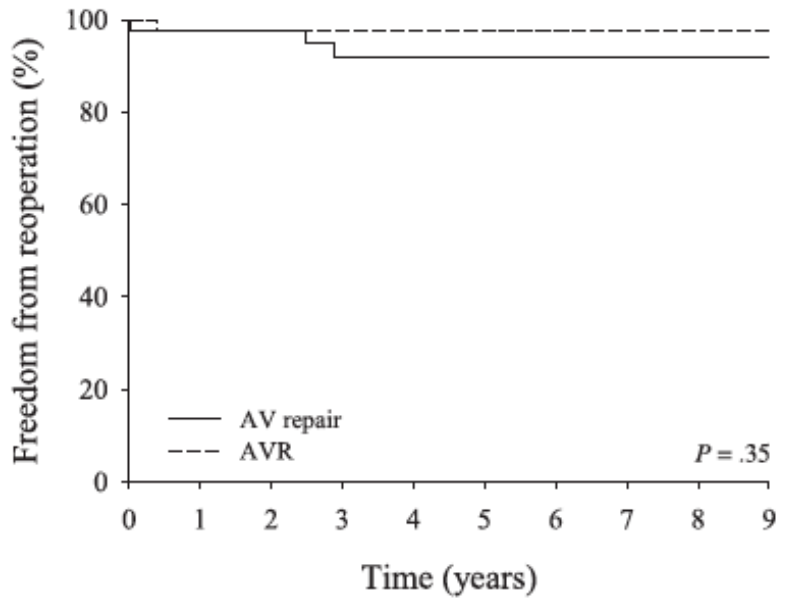
SURVIVAL



AV repair	44	41	39	35	31	28	26	22	17	13
AVR	44	38	33	30	24	20	17	15	13	11

FIGURE 2. Kaplan-Meier survival curves comparing overall postoperative survival among patients undergoing aortic valve (*AV*) repair (*solid line*) or aortic valve replacement (*AVR*) (*dashed line*). Numbers at *bottom* indicate patients at risk. The *dotted line* shows the survival of the age- and gender-matched Belgian population.

Freedom from Reoperation



AV repair	44	41	38	32	28	25	23	22	14	10
AVR	44	37	32	29	23	20	17	15	13	12

FIGURE 4. Kaplan-Meier survival curve comparing freedom from aortic valve reoperations among patients undergoing aortic valve (*AV*) repair (*solid line*) or aortic valve replacement (*AVR*) (*dashed line*).

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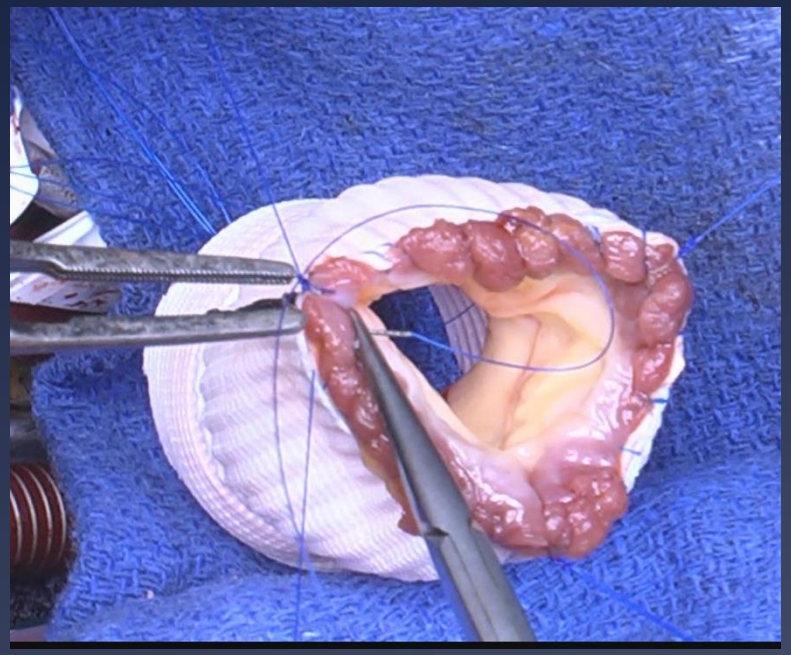
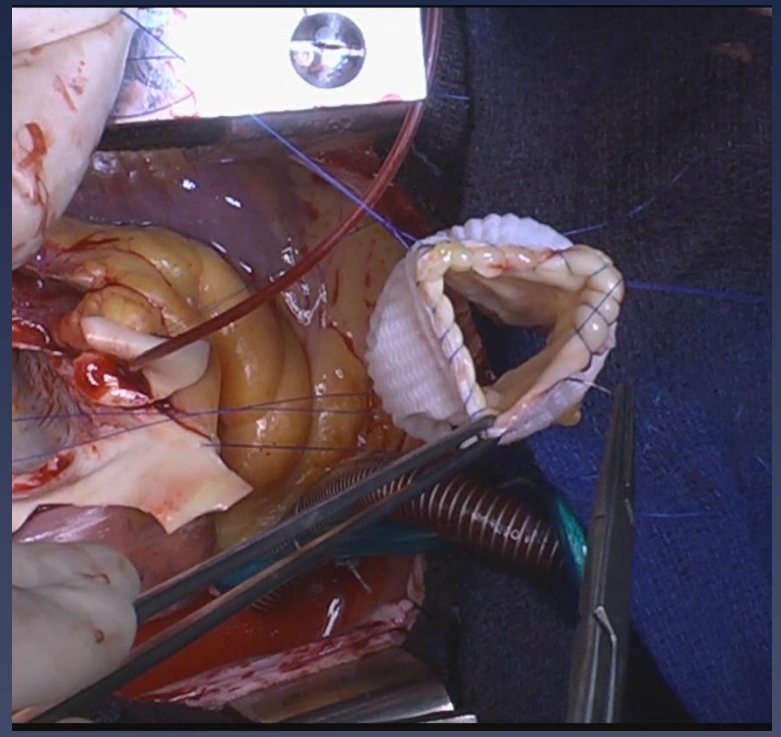
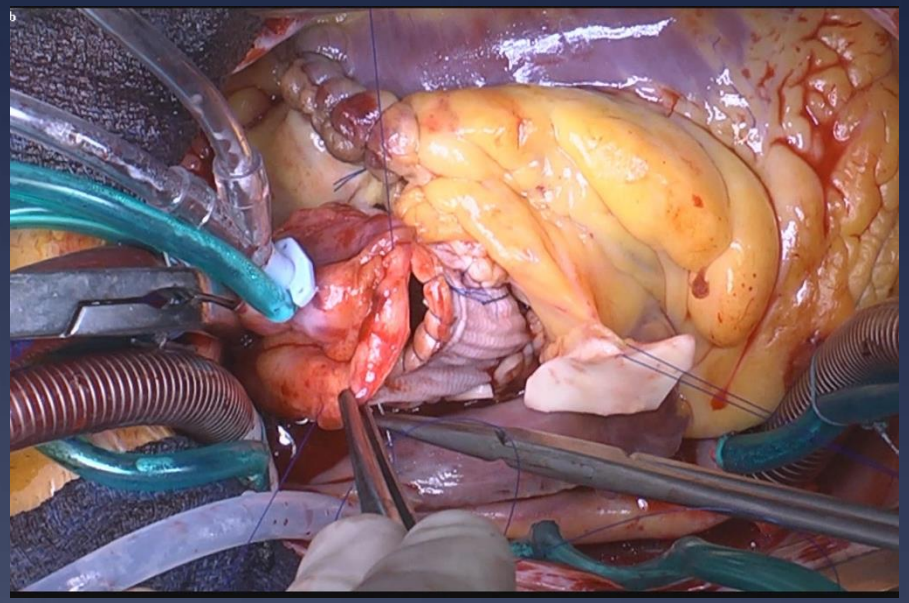
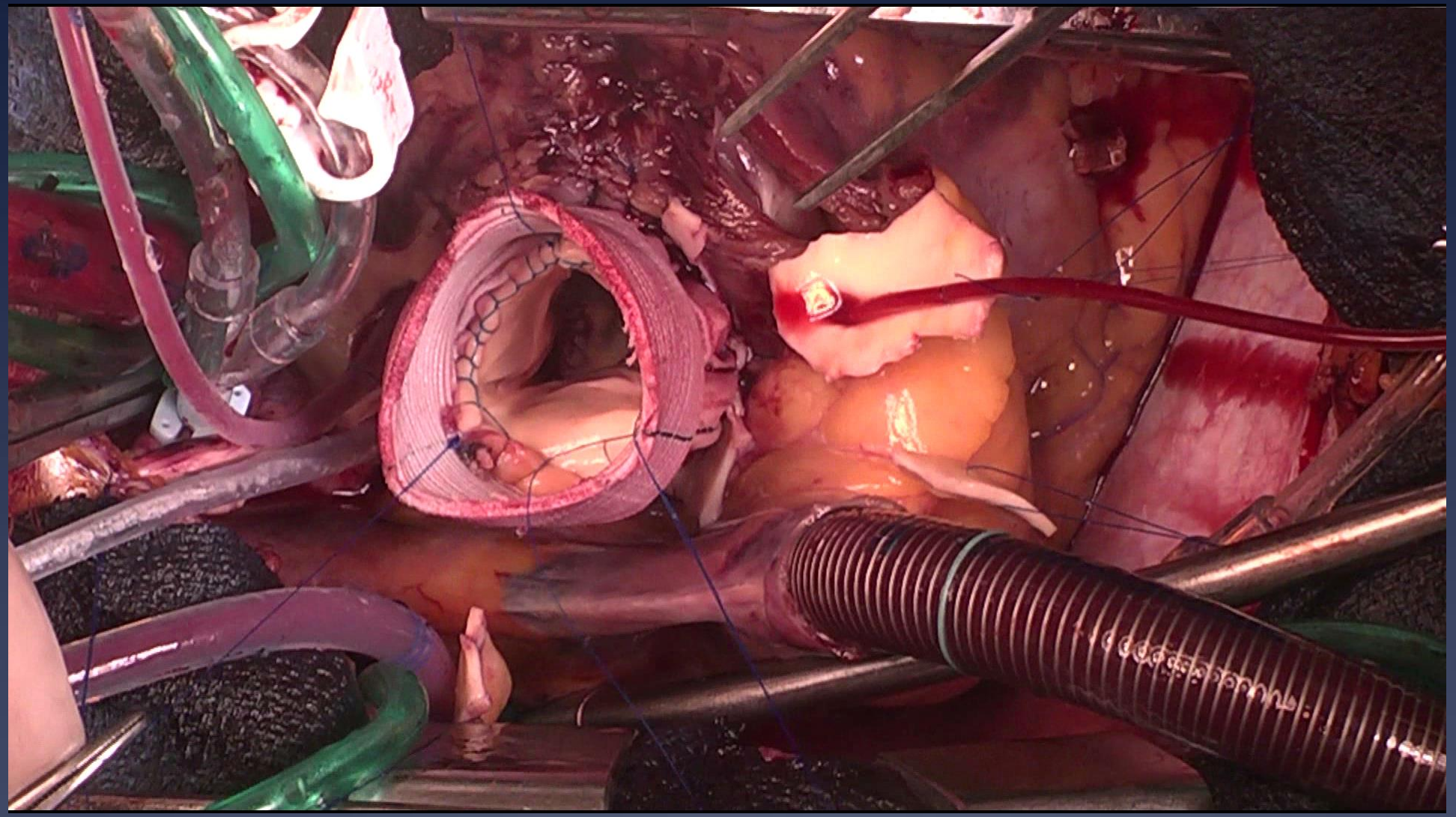
2. Ross in Valsalva



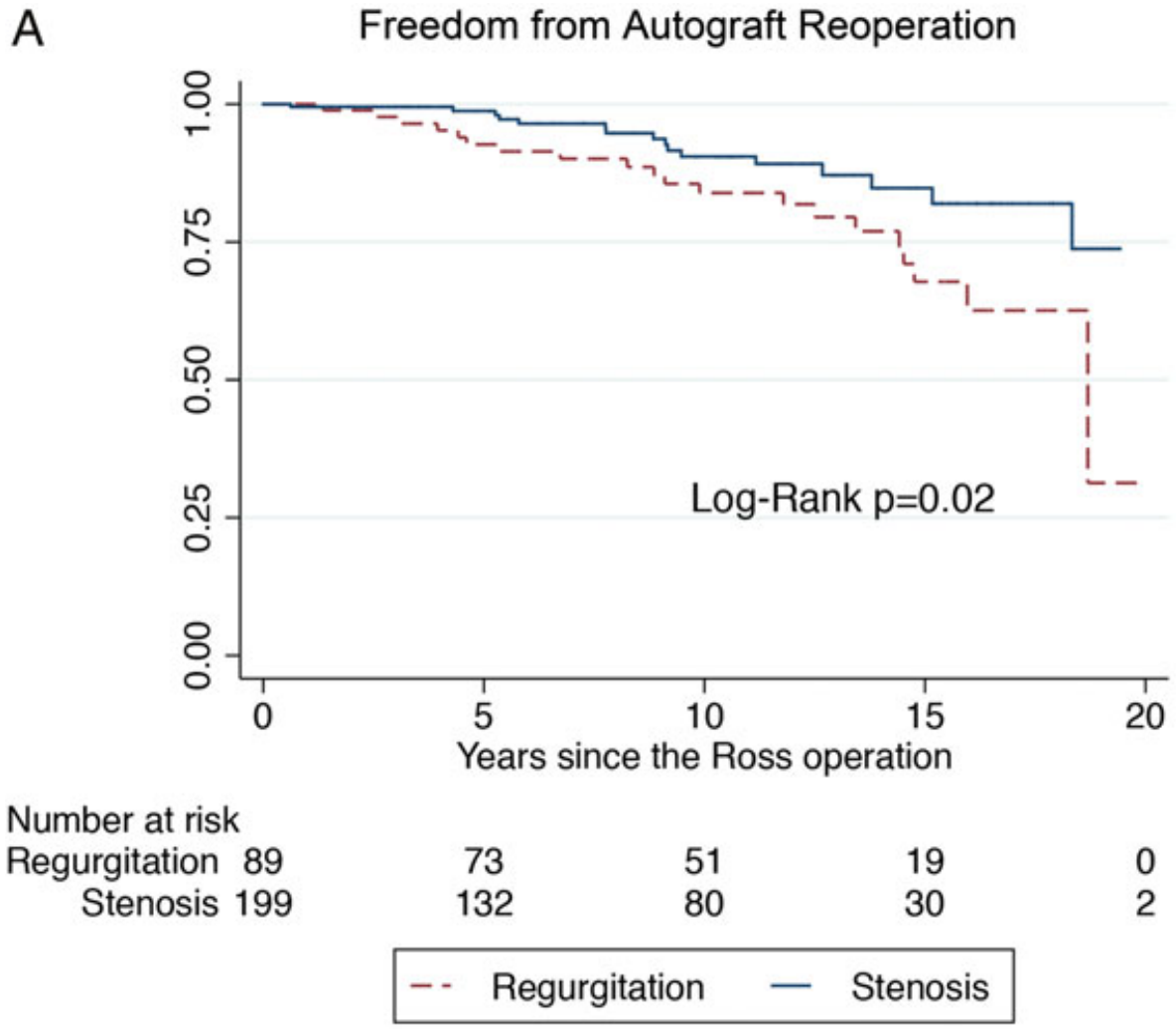




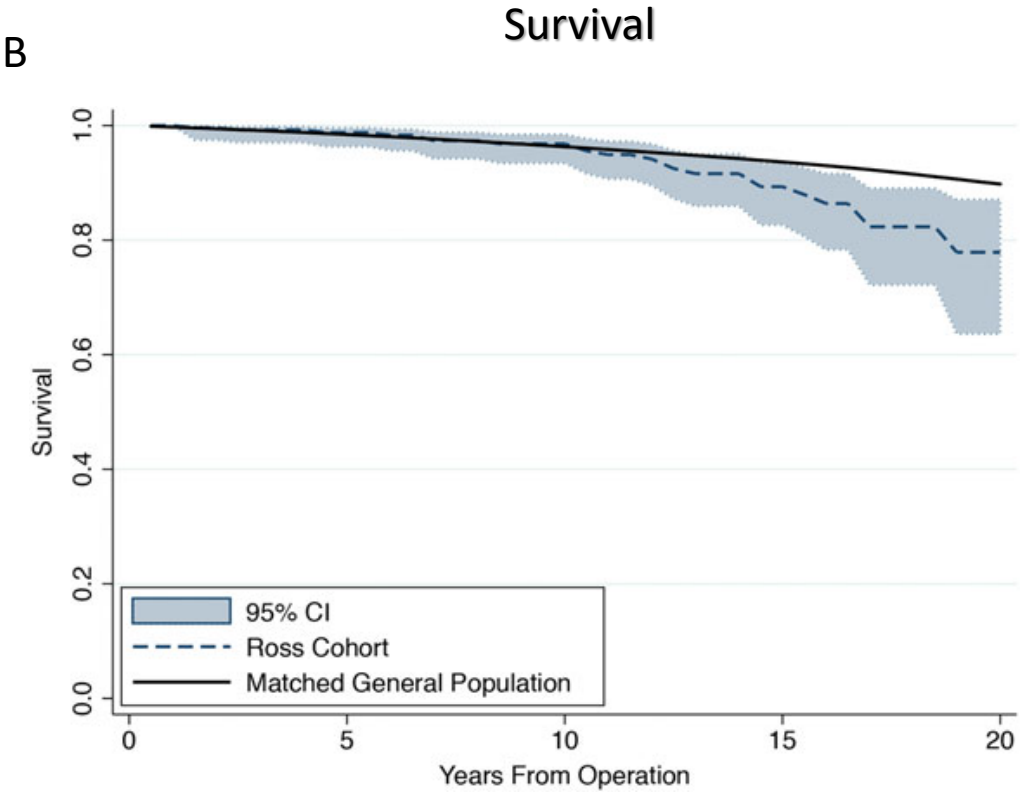


The Ross procedure
our experience

A



B



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	Towards TAVR	Towards SAVR
STS < 4%		+
STS > 4%	+	
Age < 75		+
Age > 75	+	
Previous cardiac surgery	+	
Frailty	+	
Mobility reduced	+	
Endocarditis suspicion		+
TF access	+	
Previous thracic radiotherapy	+	
Calcified Aorta	+	
Anticipated PPM		+
Scoliosis	+	
Low coronary ostia		+
Insuitable aortic annulus size with TAVR		+
Insuitable root diameter with TAVR		+
Bicuspid		+
Thrombus		+
Asc Aorta aneurysm		+
Septal bulge		+
Bypass		+

Differents Challenges for TAVR in AR

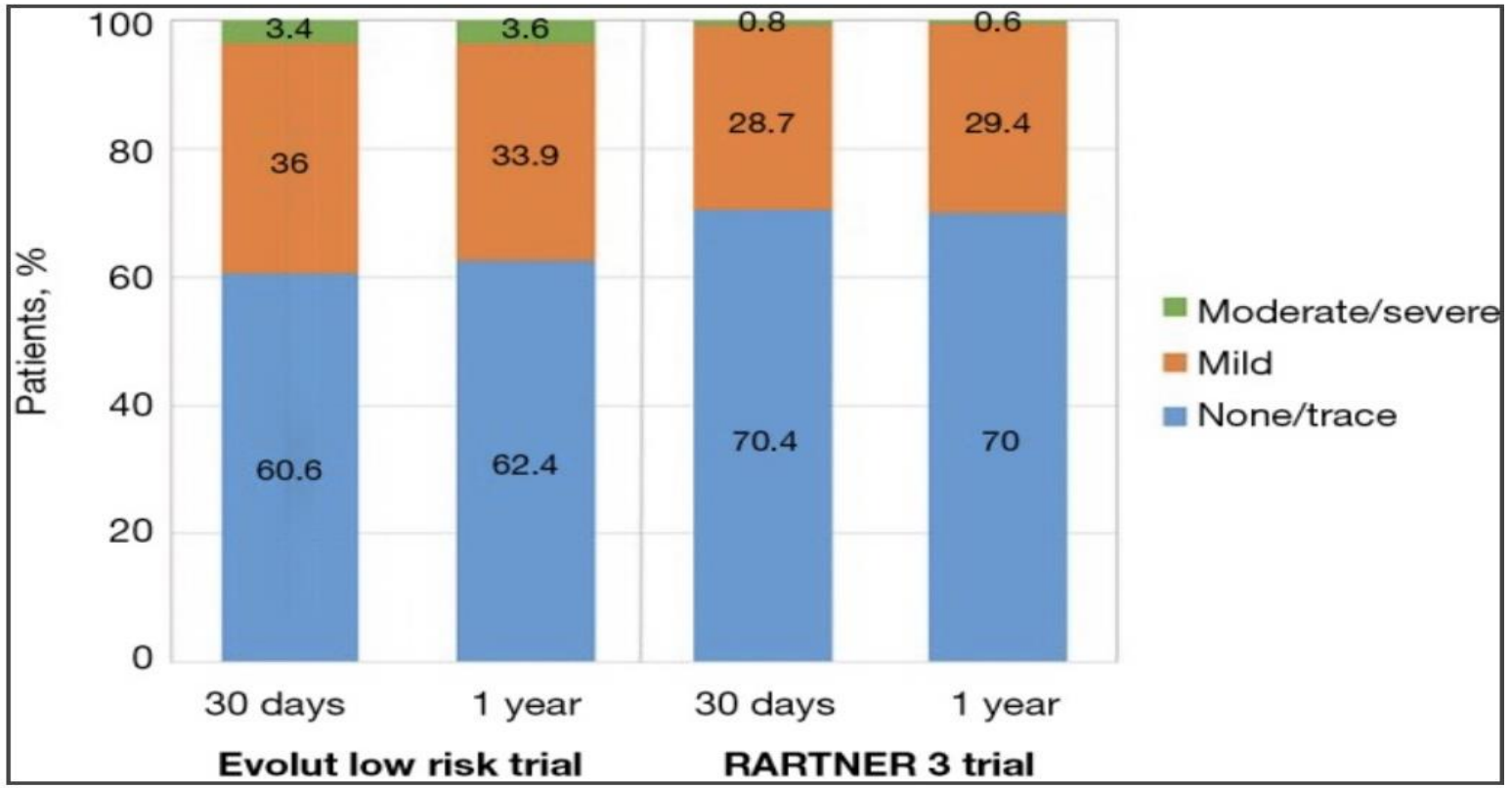
1- The lack of calcium in aortic regurgitation:

- The absence of a circular, rigid frame of calcium at the annulus, commonly seen in AS
- increased the risk of TAVR device dislodgement, malposition, and embolization.

2- PVL

- Lack of annular and leaflet calcium in AR also leads to higher rates of paravalvular leak as compared to AS cohorts.
- The fabric skirt on new-generation TAVR devices often does not provide enough cuff in AR to prevent PVL.
- AR valves are more elastic than stenotic valves and so can expand to a greater degree during valve deployment.
- Standard TAVR sizing calculations could leave devices significantly undersized.
- Only moderate PVL seems to affect clinical outcomes, however mild PVL may potentially become an issue in patients with longer life-expectancy.

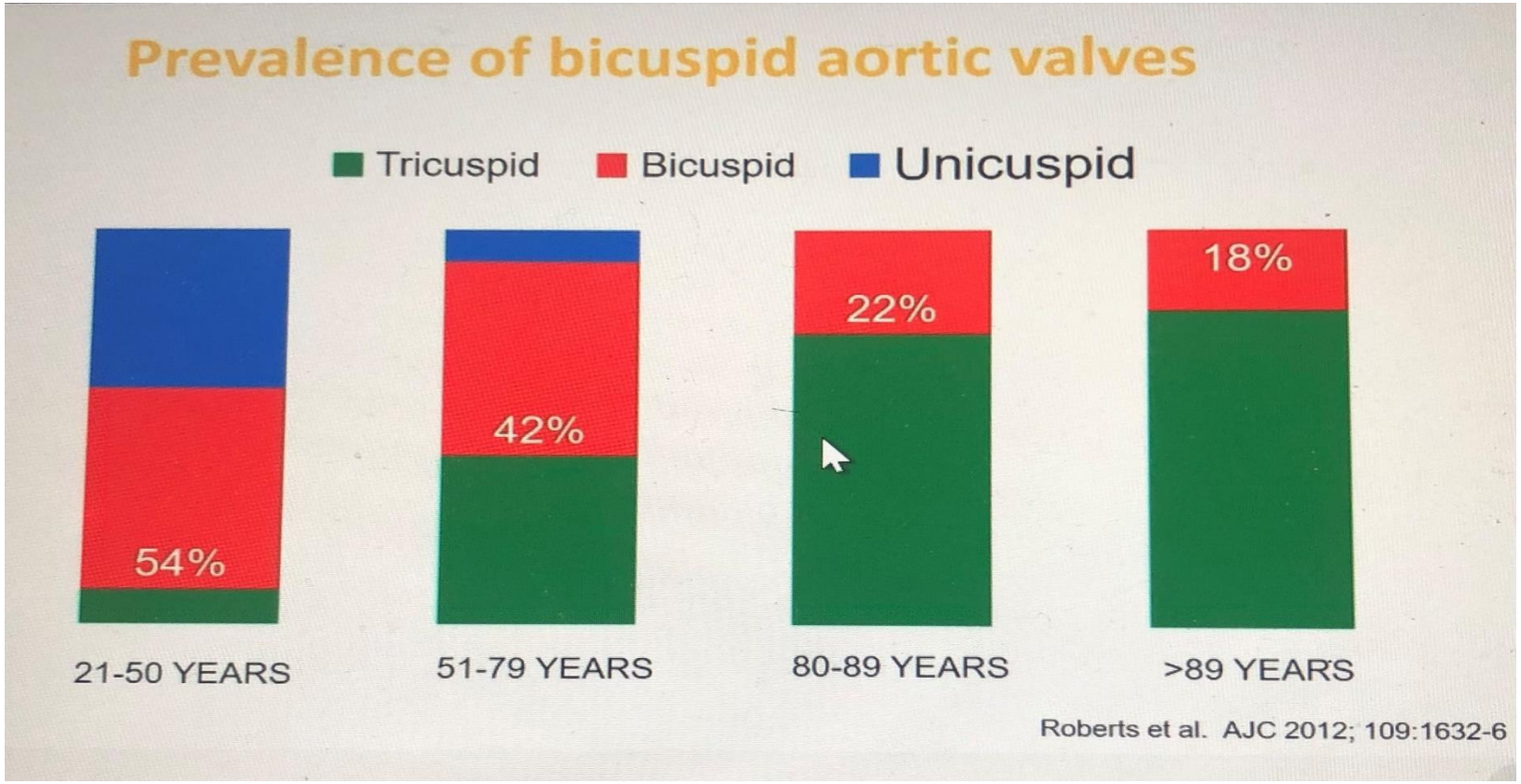
PVL in low-risk patients after TAVR (for aortic stenosis):



3- Aortopathy:

- Patients with AR typically have concomitant aortopathy (Ascending Aorta dilation, concomittant CTD)
- Aortopathy, coupled with changes in the leaflets and a larger annulus, further increases the risk of valve dislodgement, malposition, and embolization leading to a worse overall outcome,
- TAVR would not treat the entire pathology.

4- Valve Morphology:



5- Pacemaker:

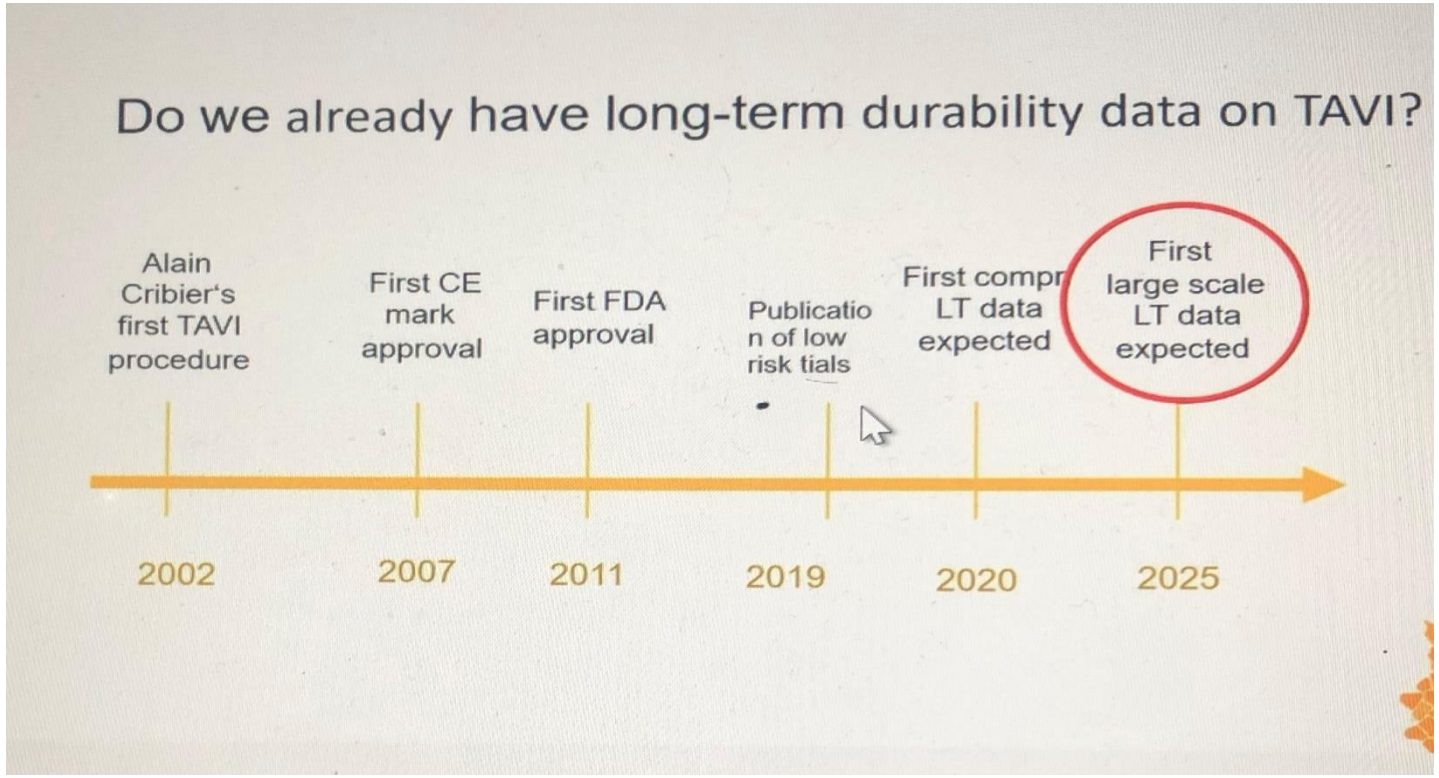
- PARTNER 3: TAVR 6.5% vs SAVR 4% **despite** much more new LBBB in TAVR compared to SAVR (24% vs 8%)!

- Evolut Low risk:TVAR 17.4% vs SAVR 6.1%.
- *SURTAVI: 26%!*

6- TAVR valve Durability:

AR = younger patients

Concerns: Leaflet thrombosis, tissue fragmentation because of crimping, circular vs,elliptical expansion, Leaflet stress, strain, fatigue.

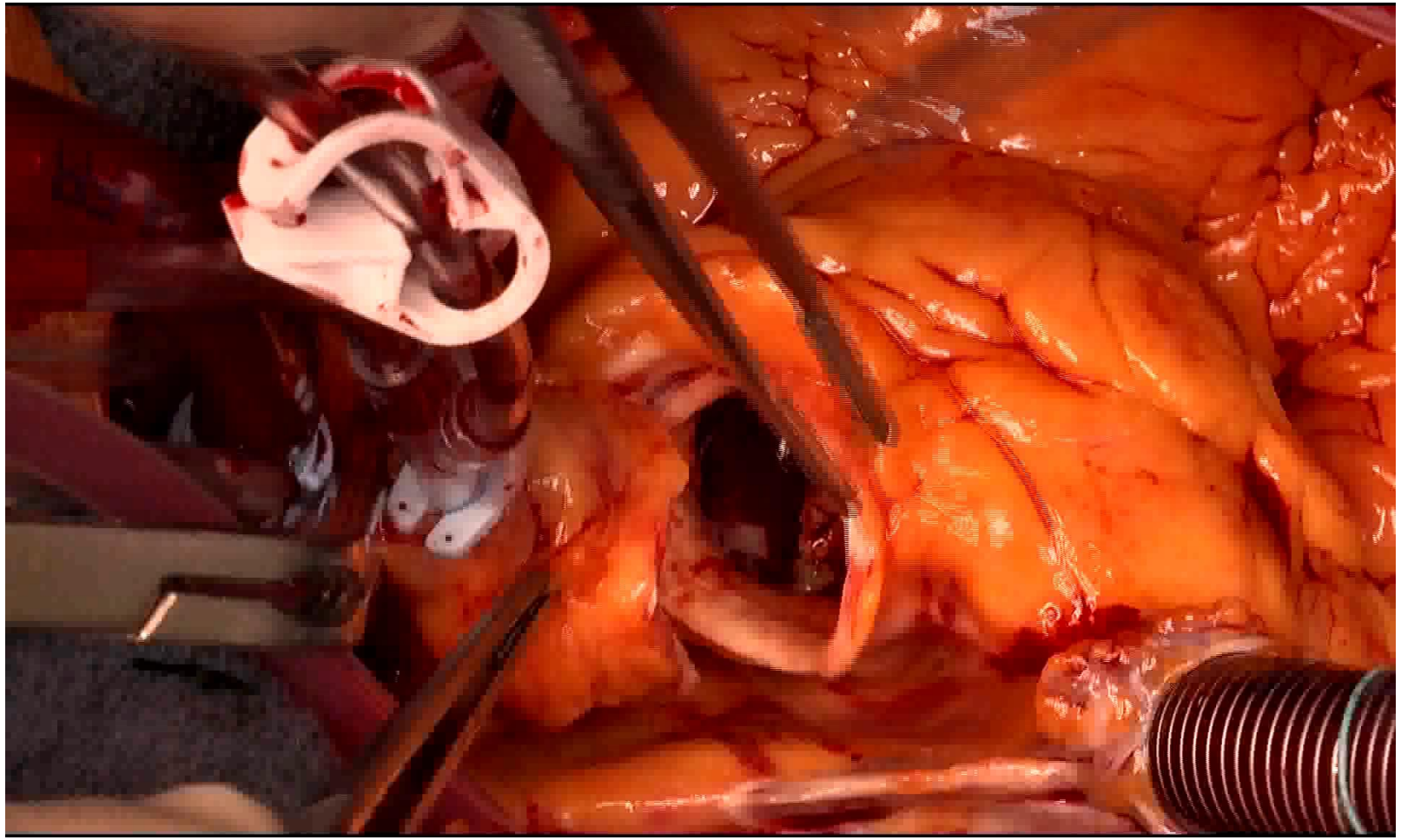


Re-operation after TAVR:

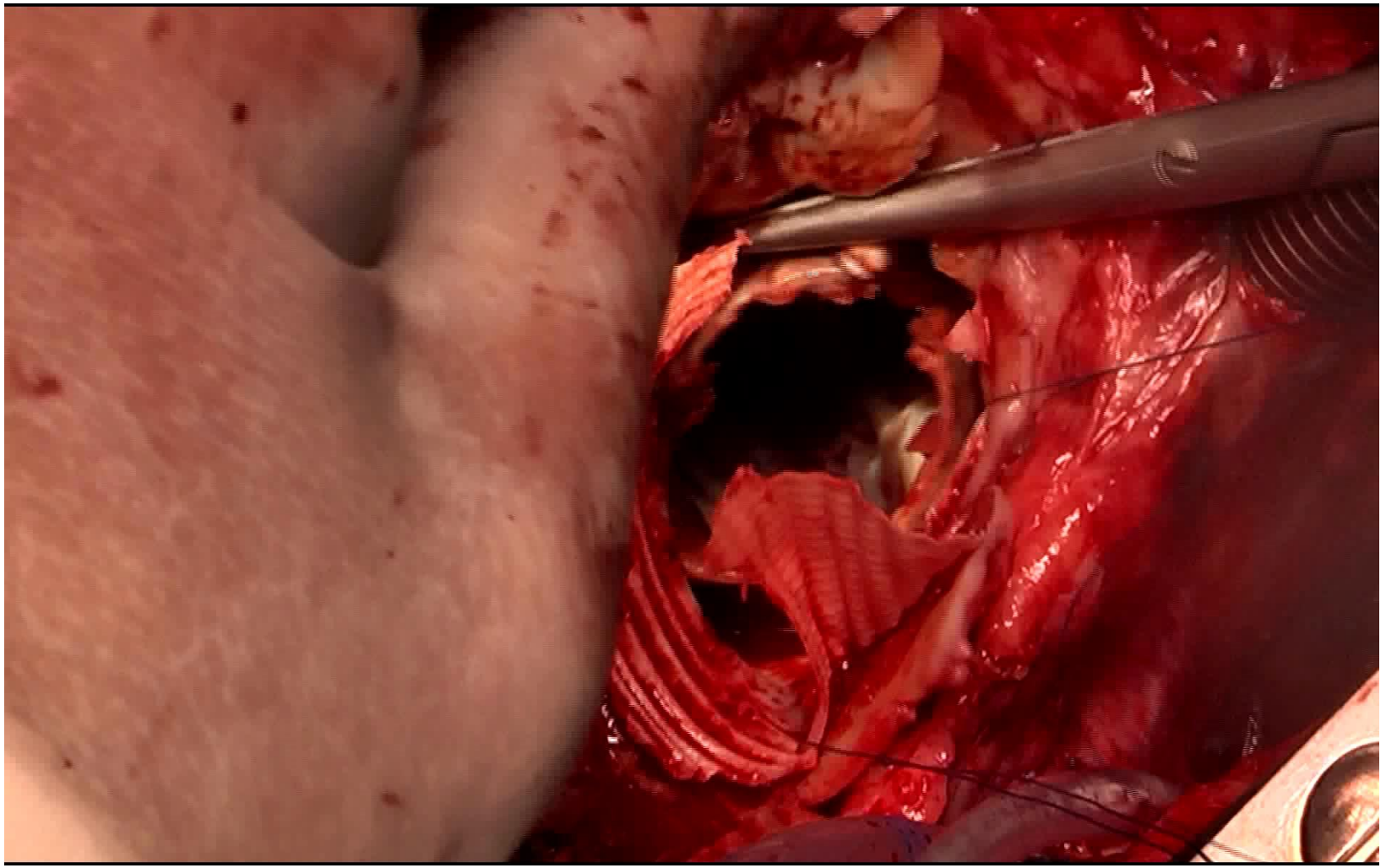
Endovalve endocarditis operation:

Not so easy… Many concerns:

1- Extensive resection of infected tissue
2- Annular damage
3- Coronary ostia damage
4- Mitral valve proximity
5- Conductive tissue proximity



Severe PVL after TAVR in an old bioprosthesis (Valve-in-Valve): Ross operation



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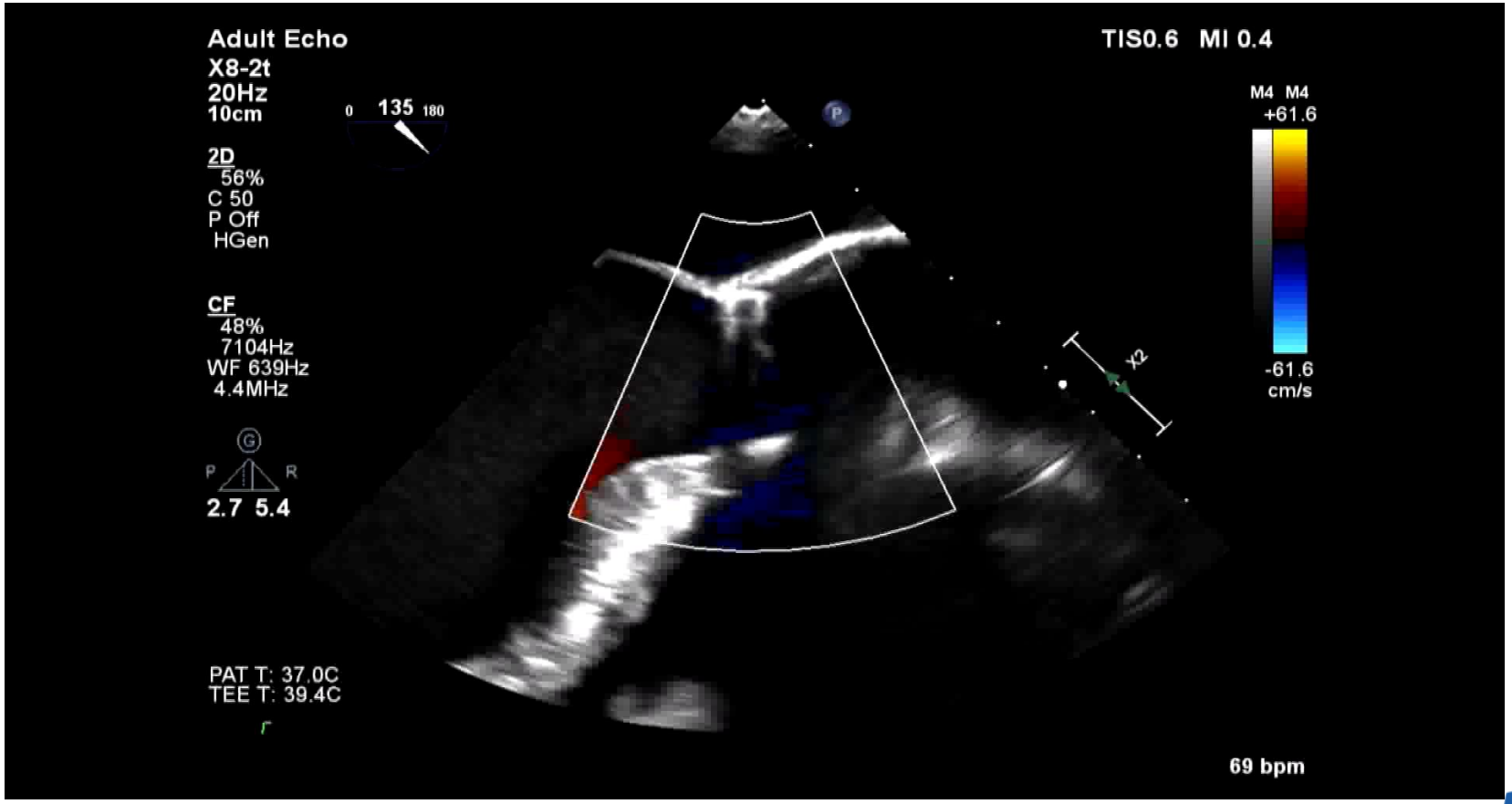
Valve Extraction: Mitral valve repair + Ross intervention after TAVR implanted in a Marfan patient who was already operated with a bentall operation for root dilation.



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In very selected cases, TAVR for AR could be an acceptable solution.

Conclusion

- Aortic valve repair is the Gold Standard treatment for aortic regurgitation, especially in young patients.
- In terms of mortality, freedom for re-operation or endocarditis, surgical aortic valve repair has excellent results in experienced hands.
- Re-operation after TAVR is a challenging procedure.
- TAVR in case of AR, should be reserved only for old and high risk patients.

Thanks

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