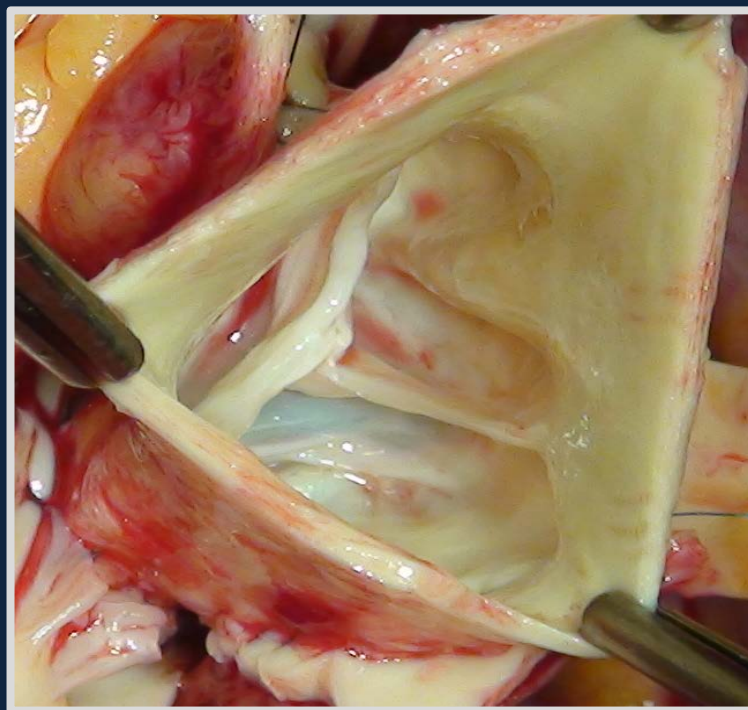




Department of Cardiac Surgery

Instituto de Neurologia e Cardiologia de Curitiba (INC-Cardio)

DECELLULARIZED AORTIC VALVE ALLOGRAFTS 10 YEARS EXPERIENCE



Francisco Diniz Affonso da Costa
Human Tissue Bank – PUCPR - Brazil

DISCLOSURES

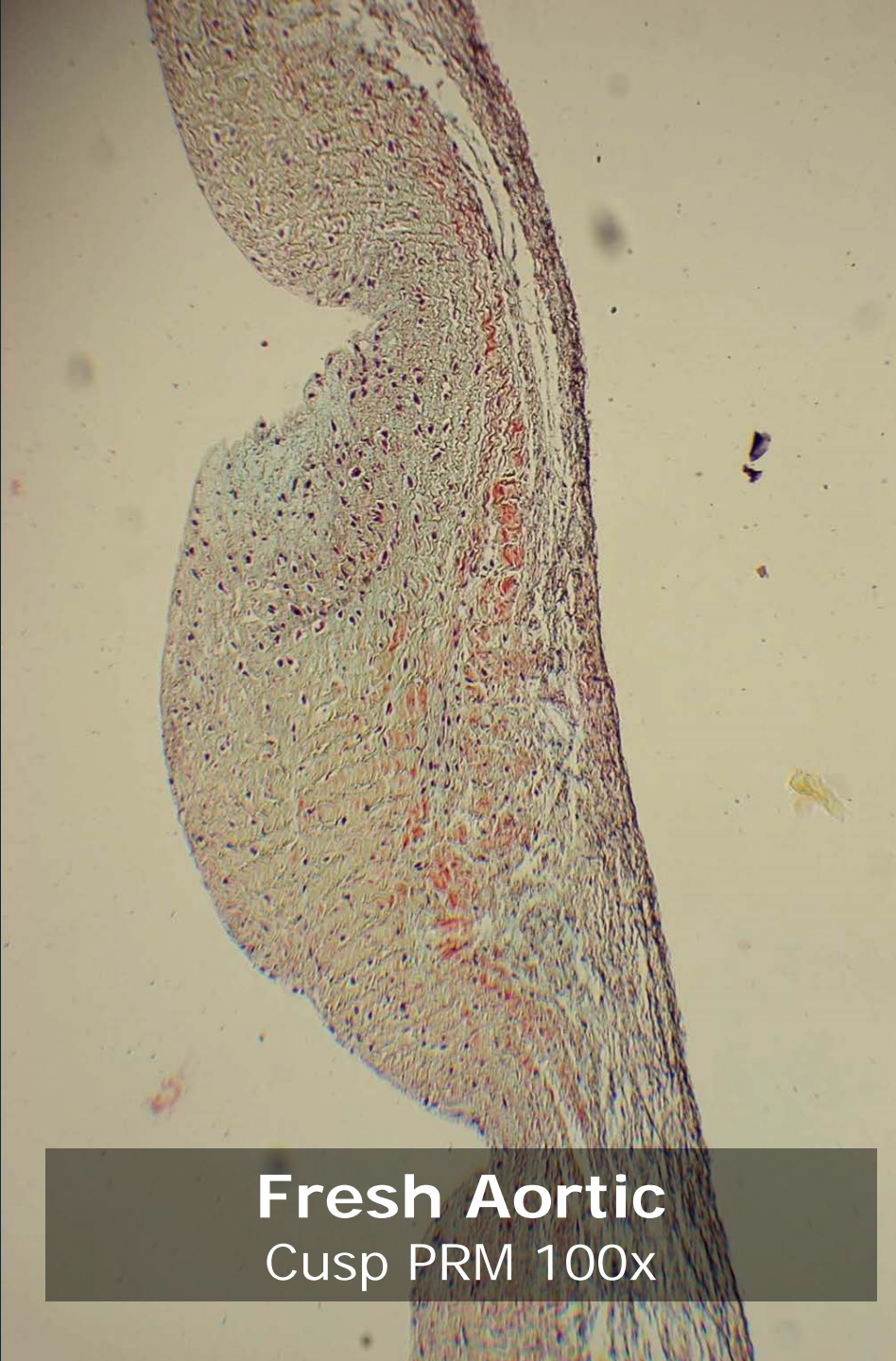
- ✓ Ownership and patent license of the SDS decellularization technique (*d-CELL Allograft*)
- ✓ Consultant and Member of the Advisory Board Tissue Regenix Ltd – England

DECELLULARIZED HEART VALVE

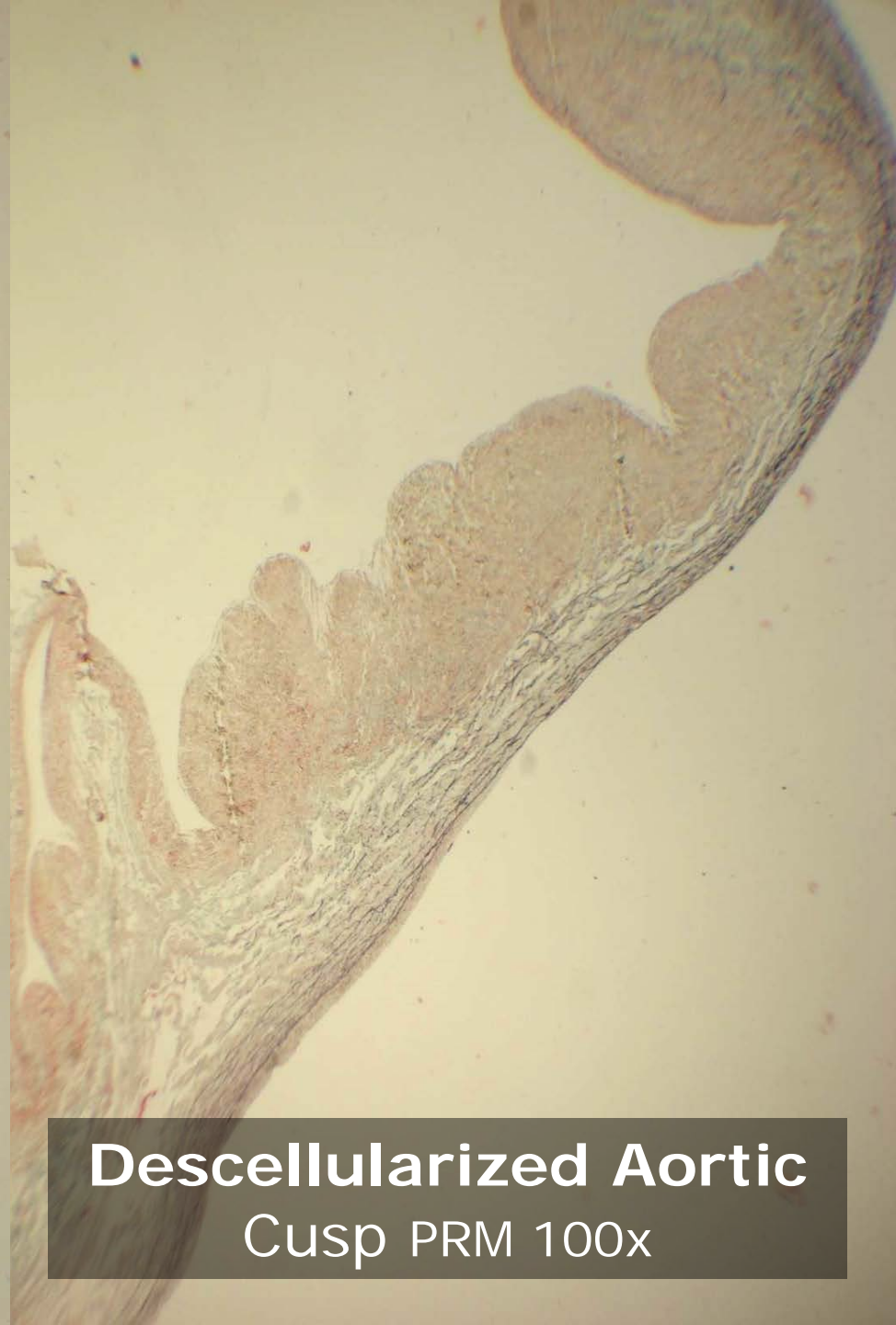
dCELL[®]
Technology



- ✓ Decellularization Technique
- ✓ Fresh Allografts, no cryopreservation
- ✓ Storage at 4° C for up to 3 months

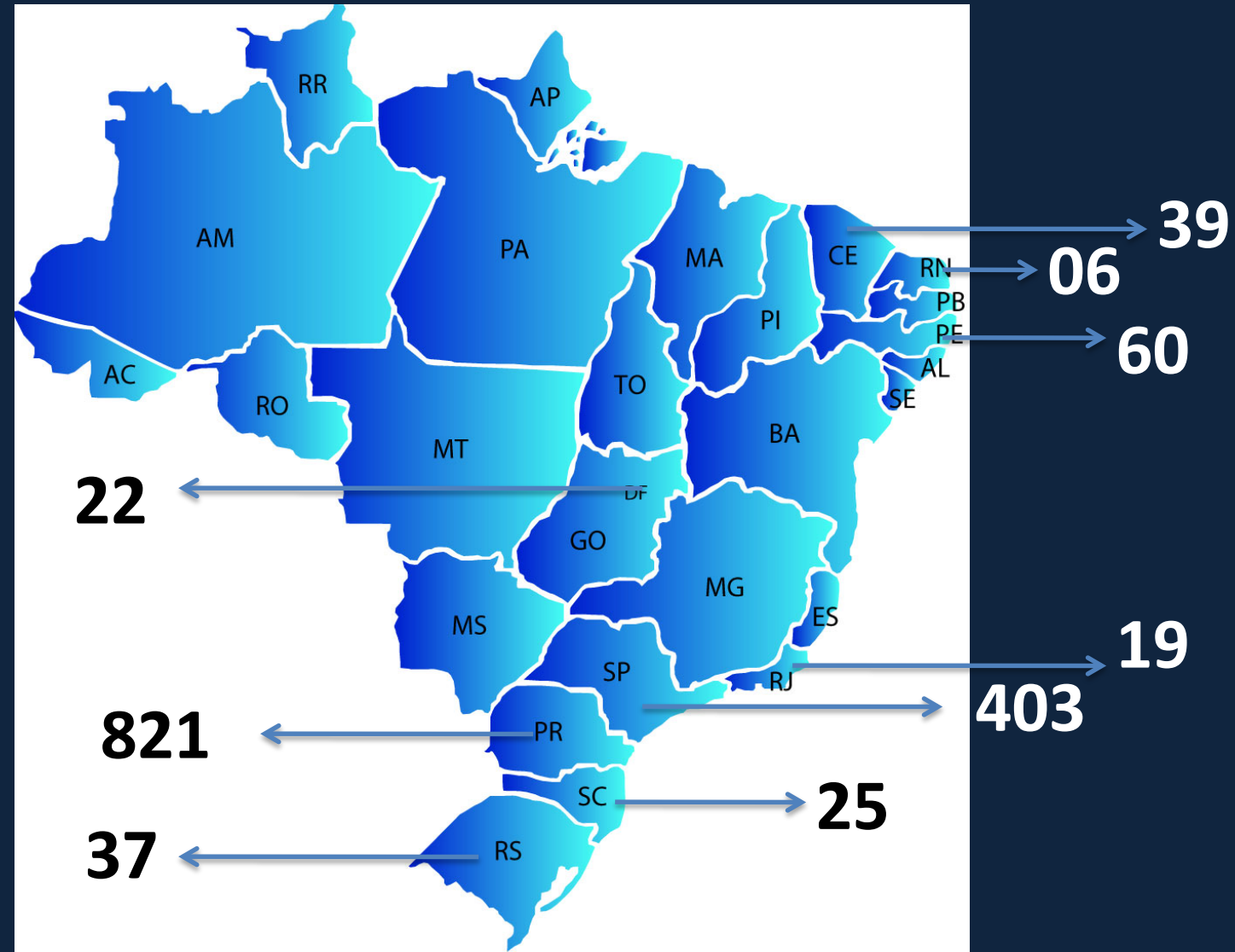


Fresh Aortic
Cusp PRM 100x



Descellularized Aortic
Cusp PRM 100x

Decellularized Heart Valves Brazilian Experience (2005-2015) Number of Implants = 1432 cases



Decellularized Heart Valve Allografts

- Pulmonary Allografts for RVOT Reconstruction during the Ross Operation
- Aortic Valve Allografts for AVR as Root Replacement
- Decellularized Allografts for Pediatric Patients under 12 Years of Age with Complex Congenital Heart Disease (ongoing study)

CLINICAL DATA

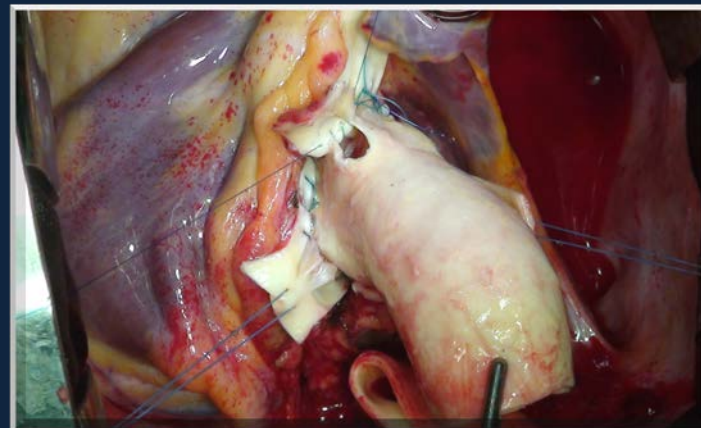
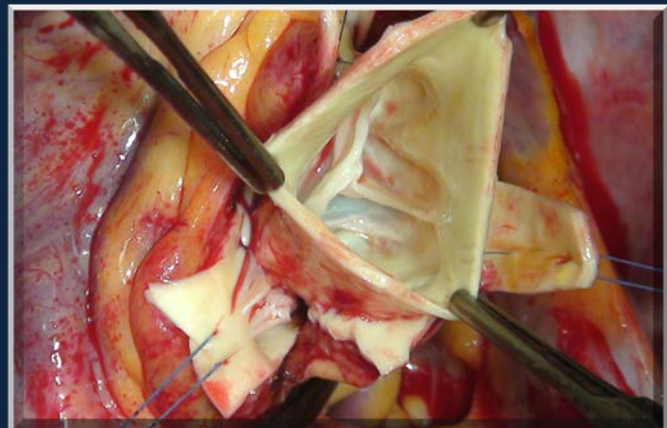
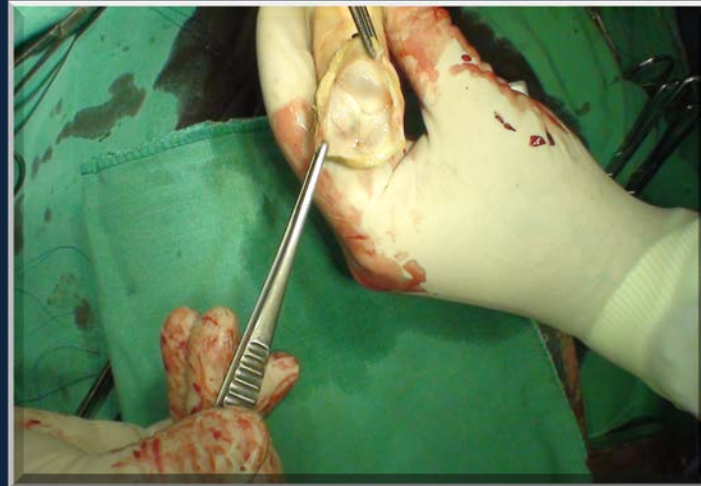
- **Study Period: Nov 2005 – Aug 2017**
- **Patients: n= 115 (High Risk Profile]**
- **Age: 45± 18 (min=0,1 – max=81)**
- **Sex: Male = 77, Female =38**
 - 26 Concomitant Mitral Valve Disease (Multiple Reoperations]
 - 18 Ascending Aorta / Hemiarch Aneurysm
 - 23 Bacterial Endocarditis
 - 6 Coronary Artery Disease

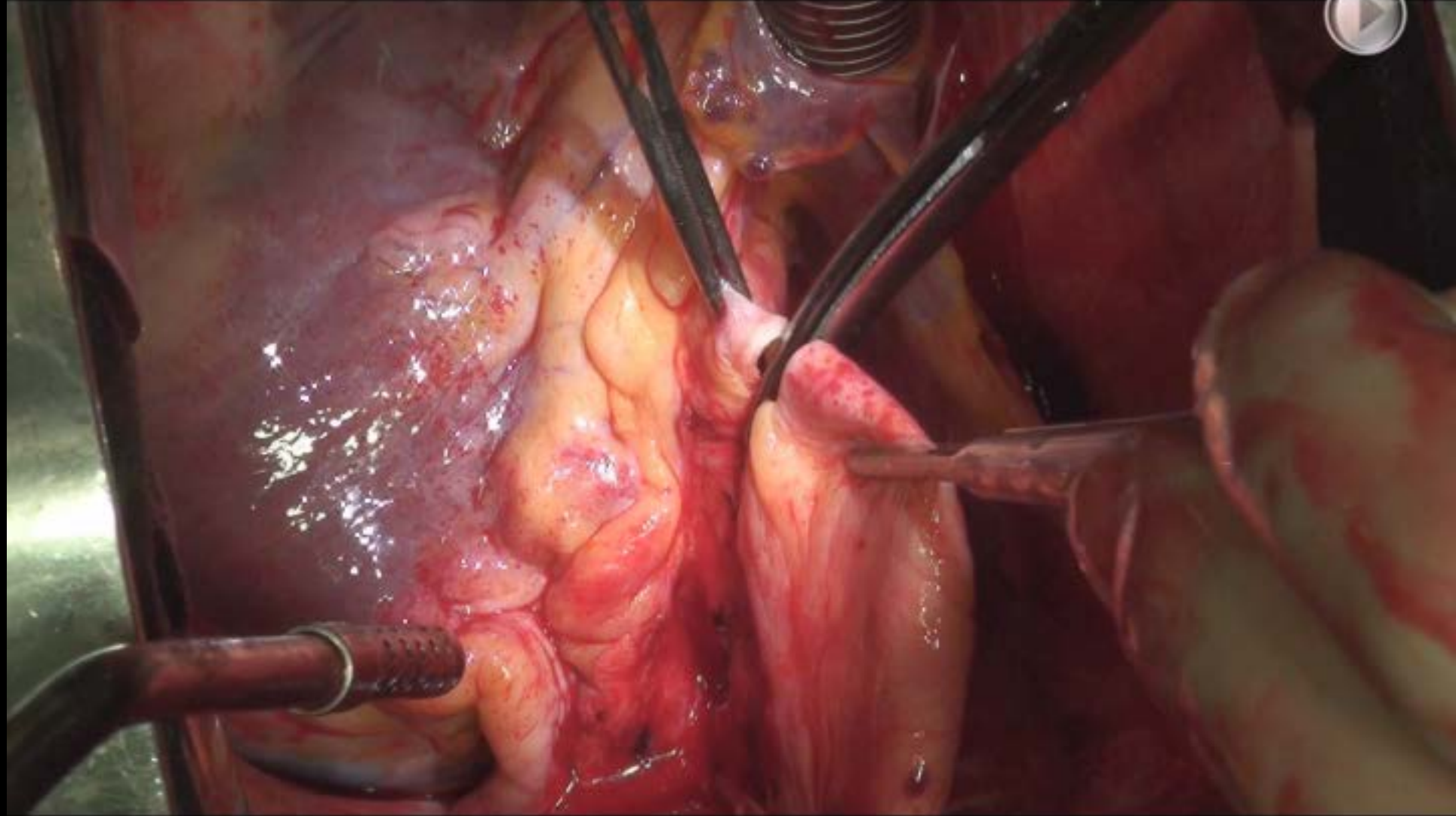
Data	n	%
Valvular Lesion		
Aortic Stenosis	41	35,6
Aortic Insufficiency	46	40
Mixed Lesion	28	24,3
Etiology		
Rheumatic	17	14,7
Congenital	31	26,9
Degenerative	24	20,8
Prosthetic Valve Dysfunction	18	15,6
Endocarditis	23	20
Acute Aortic Dissection	1	0,8
Unknown	1	0,8
NYHA Classe Funcional		
I	9	7,8
II	64	55,9
III	34	29,5
IV	8	6,9
Operation		
Primary	68	59,1
Reoperation	47	40,8

OPERATIVE DATA

- **Surgical Technique**
Aortic Root Replacement in all patients
- **Allograft Diameter**
 $21 \pm 2,7$ mm (min=6, max=31)
- **Cross-Clamp Time**
 90 ± 32 min (min=50, max=166)
- **Extracorporeal Circulation Time**
 136 ± 58 min (min=71, max=279)

Surgical Technique Root Replacement





POSTOPERATIVE EVALUATION

→ Clinical Examination

→ Echocardiography

- Before hospital discharge
- 6/12 months PO, annually thereafter
- CT Scan
- MRI

→ Follow-up

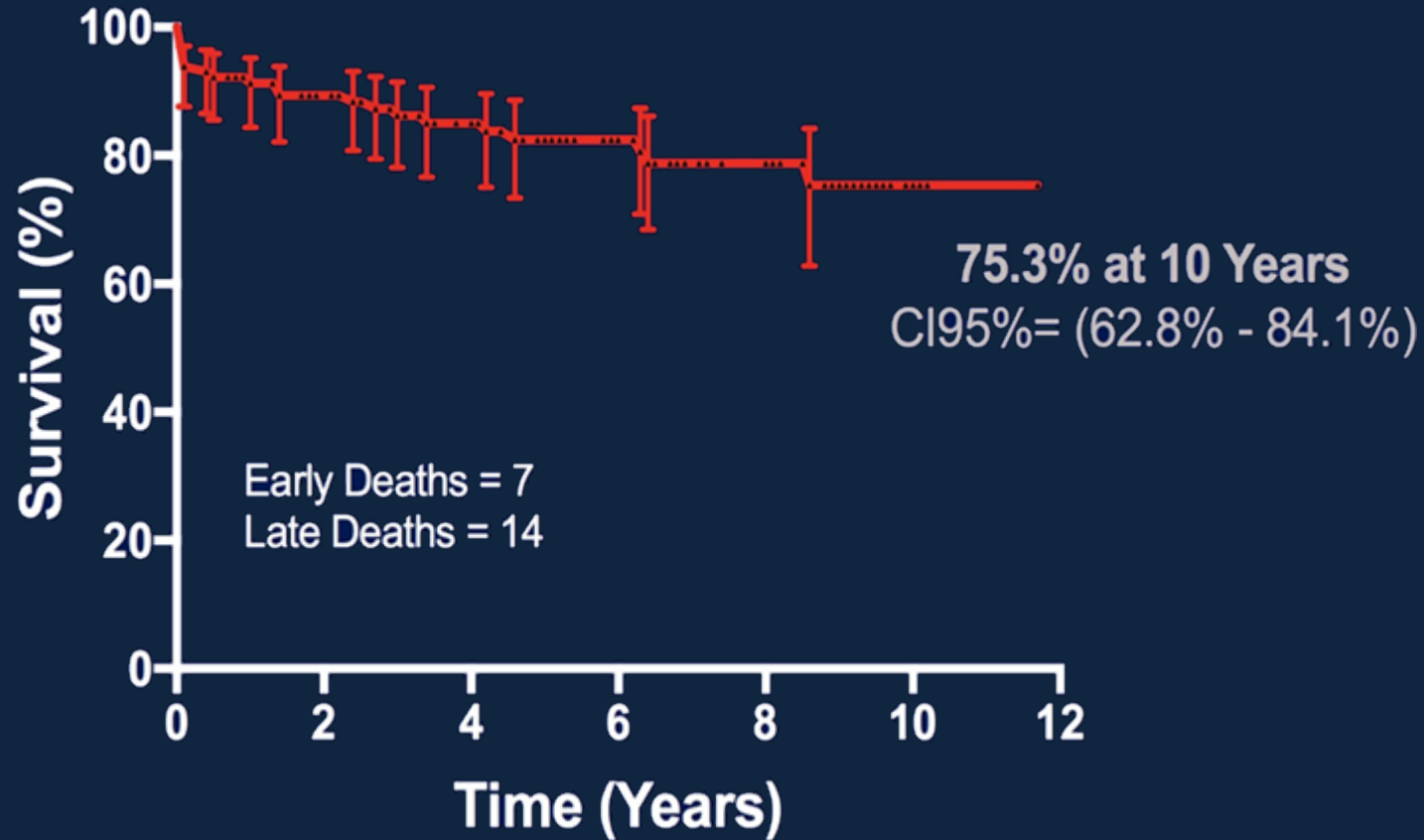
- Clinical Follow-up – **90 patients (95% complete)**
- Mean clinical follow-up time = **5,1 years (0,1 – 11,7)**

DECELLULARIZED AORTIC VALVE ALLOGRAFTS RESULTS

Early Mortality = 6.0% (7/115)

- Low Cardiac Output3
- Sepsis and Multiorgan Failure.....2
- Bleeding2

AVR WITH DECELLULARIZED AORTIC VALVE ALLOGRAFTS LATE SURVIVAL



Patients at Risk (115) (92) (69) (50) (31) (7)

DECELLULARIZED AORTIC VALVE ALLOGRAFTS CAUSES OF LATE DEATH (N=14)

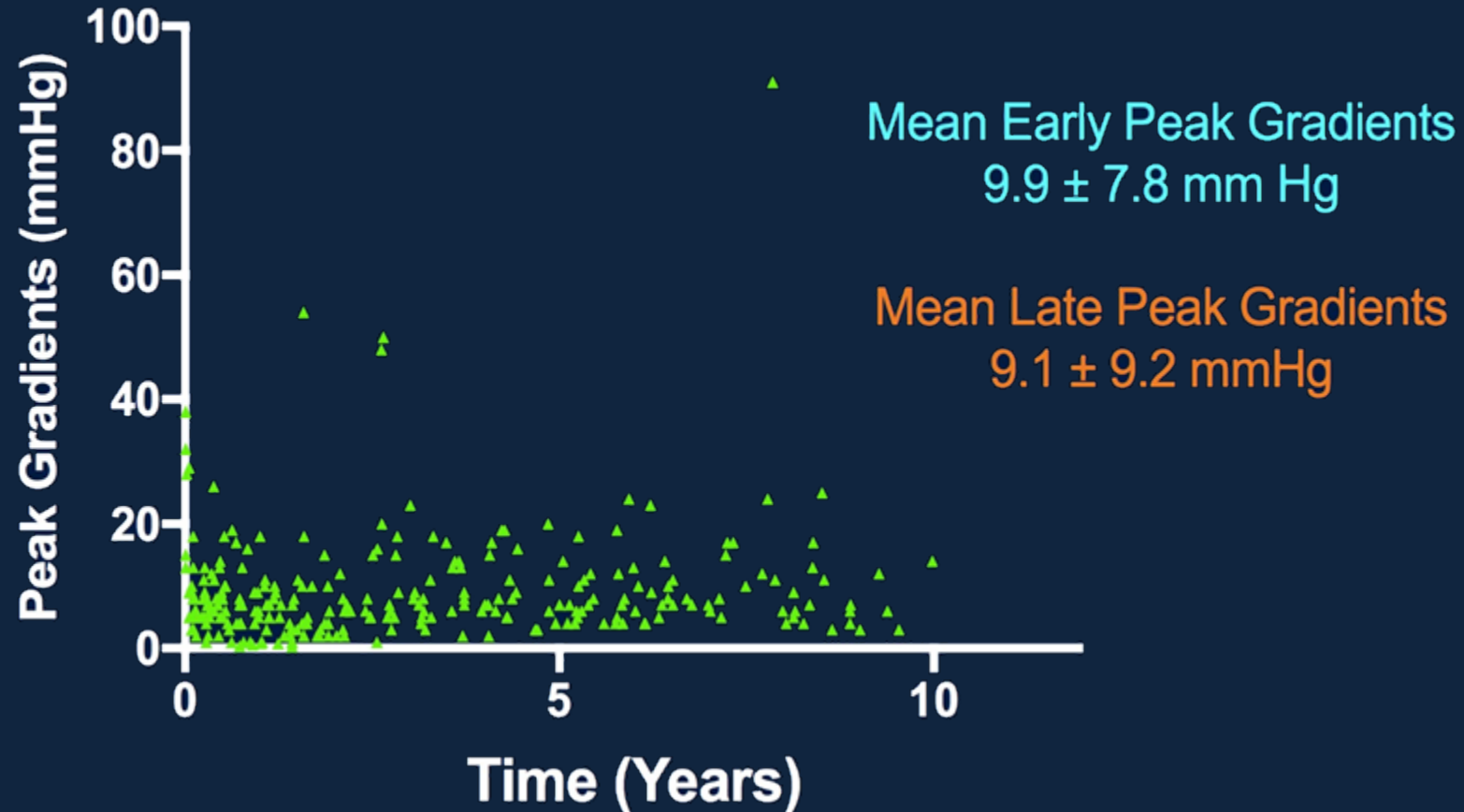
Sudden Death	2
Pneumonia	2
Cancer.....	2
Stroke	1
Acute Myocardial Infarction	1
Reoperation for CABG	1
DVP– Pulmonary Embolism	1
Trauma.....	1
Unknown	3

RESULTS

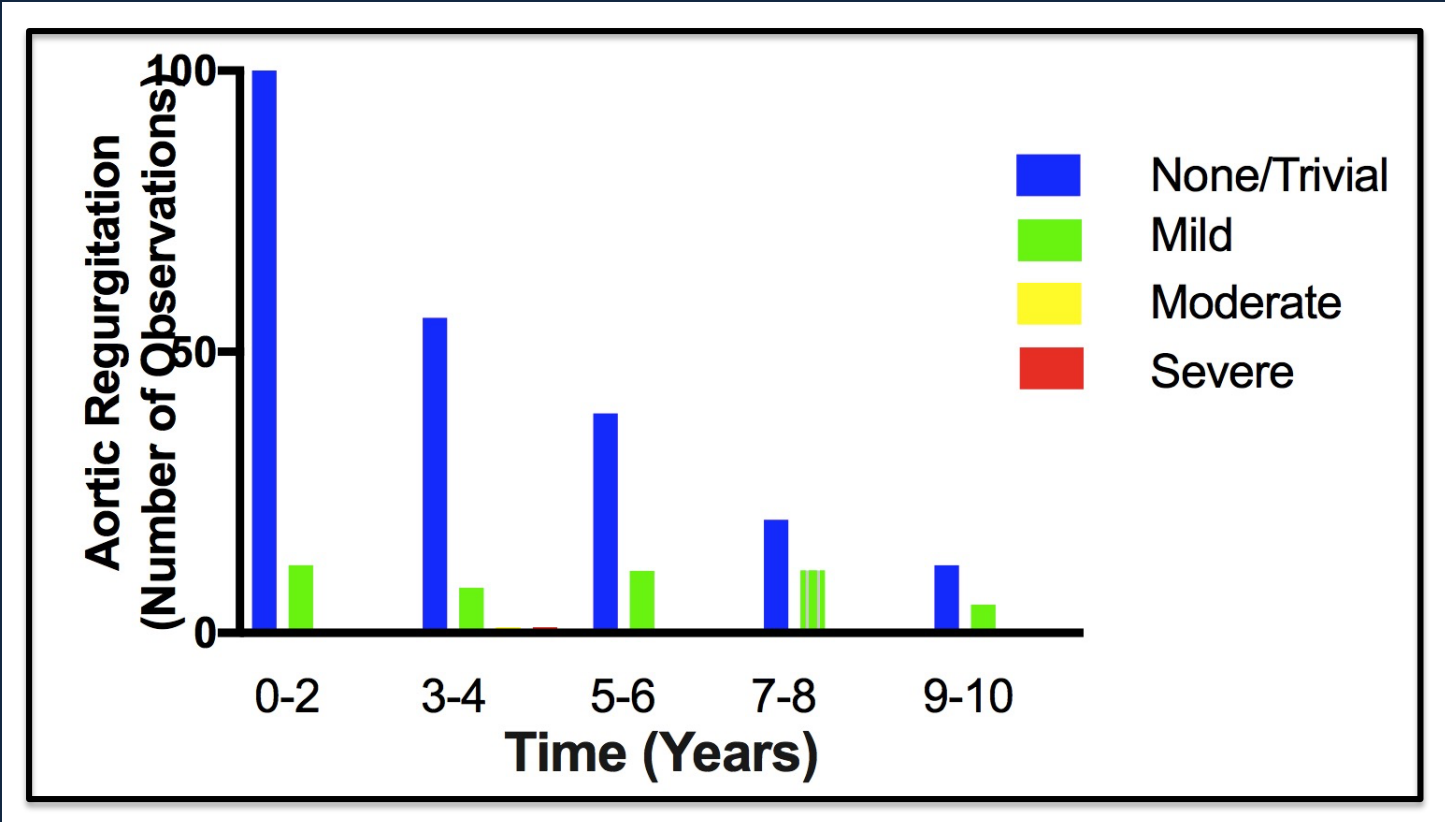
CLINICAL FOLLOW-UP

- ➔ Late Functional Status
 - NYHA I - 83 patients
 - NYHA II - 10 patients
 - NYHA III - 1 patient
 - NYHA IV – 0 patient
- ➔ 1 case of Thromboembolism (Stroke)
- ➔ No case of Bleeding
- ➔ 1 case of Bacterial Endocarditis

DECELLULARIZED AOTIC VALVE ALLOGRAFTS EARLY AND LATE MAX INSTANTANEOUS GRADIENTS

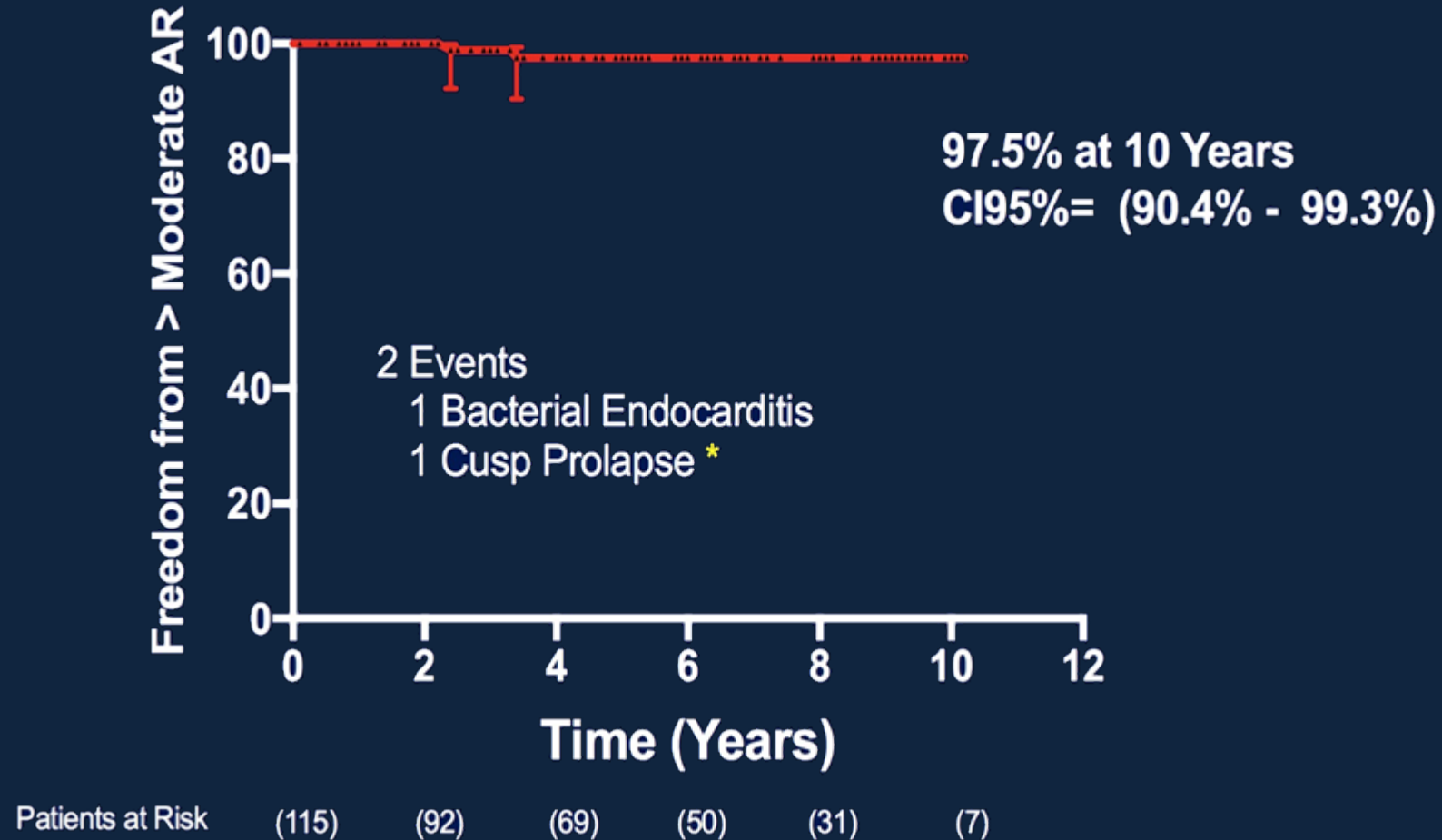


DECELLULARIZED AORTIC VALVE ALLOGRAFTS AORTIC REGURGITATION



DECELLULARIZED AORTIC VALVE ALLOGRAFTS

FREEDOM FROM \geq MODERATE AR

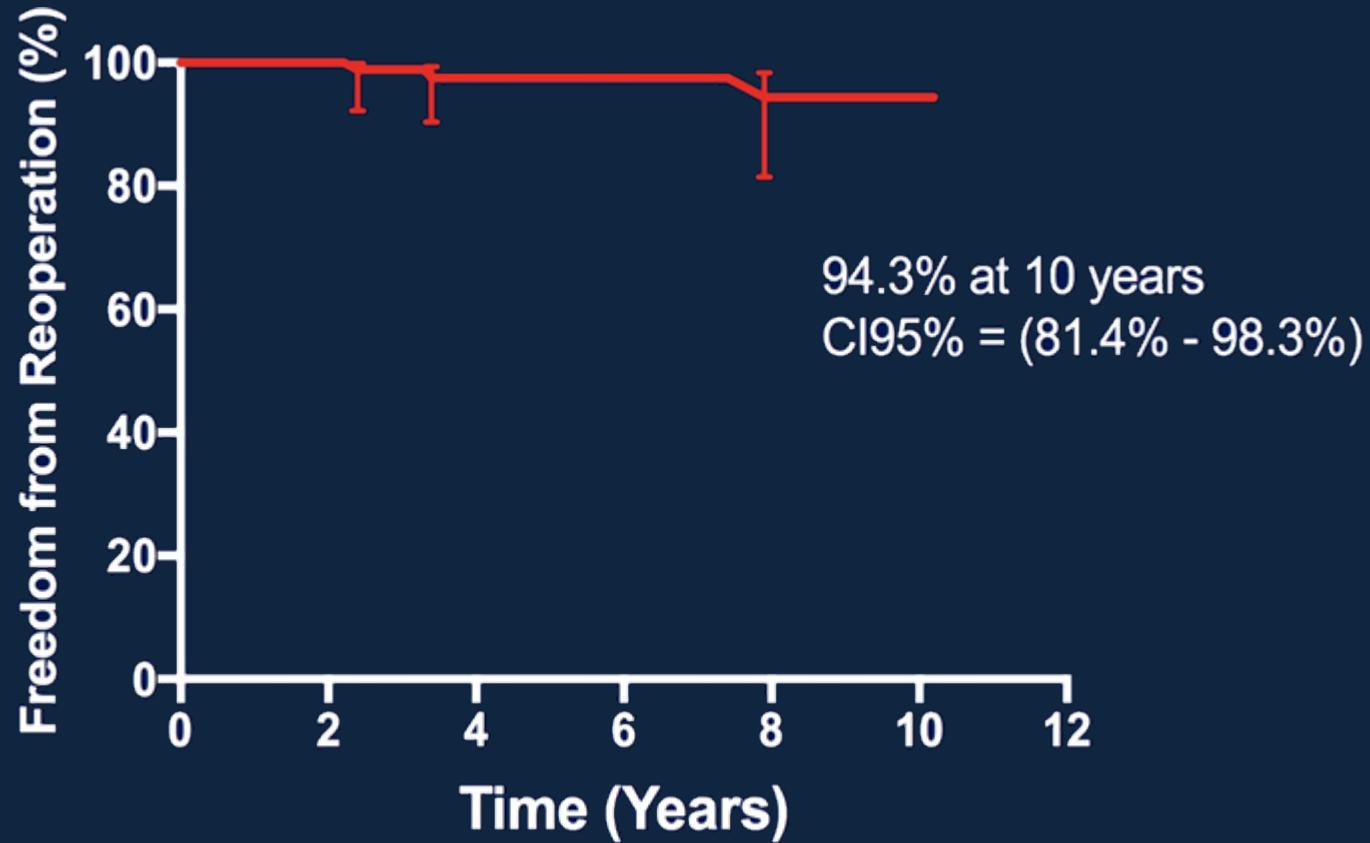


DECELLULARIZED AORTIC VALVE ALLOGRAFTS REOPERATIONS(N=3)

- ➔ AR due to Healed Bacterial Endocarditis.....1
- ➔ Primary Cusp Prolapse *1
- ➔ Patient Outgrowth1

* PATIENT REOPERATED ELSEWHERE – NO ECHO AVAILABLE – SURGEON REPORT ONLY

DECELLULARIZED AORTIC VALVE ALLOGRAFTS FREEDOM FROM REOPERATION ON THE ALLOGRAFT

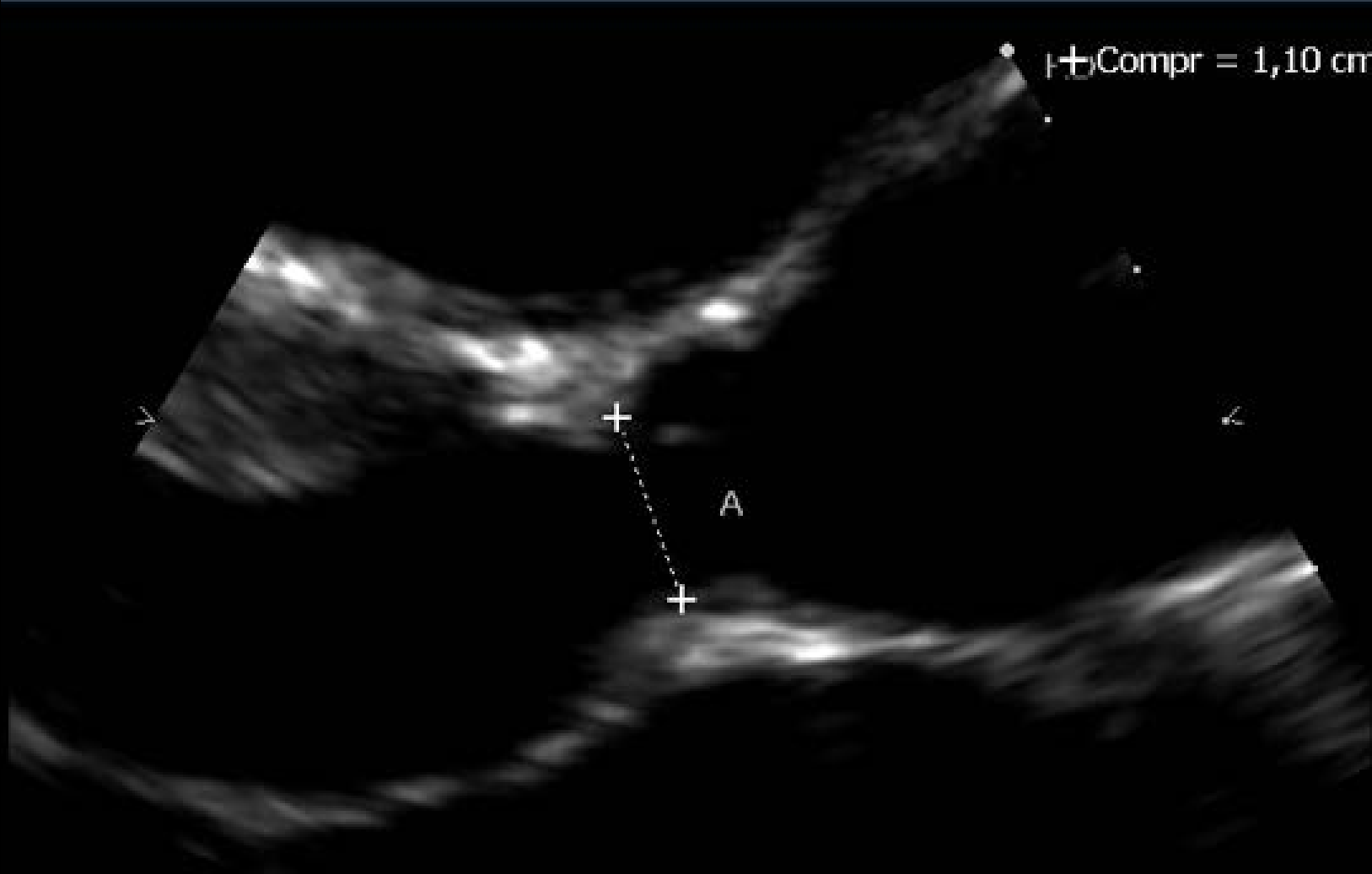


Patients at Risk (115) (92) (69) (50) (31) (7)

FREITAS, LUCAS
13-09-24-094015

I.N.C

24/9/2013 PHILIPS
09:48:14



Compr = 1,10 cm

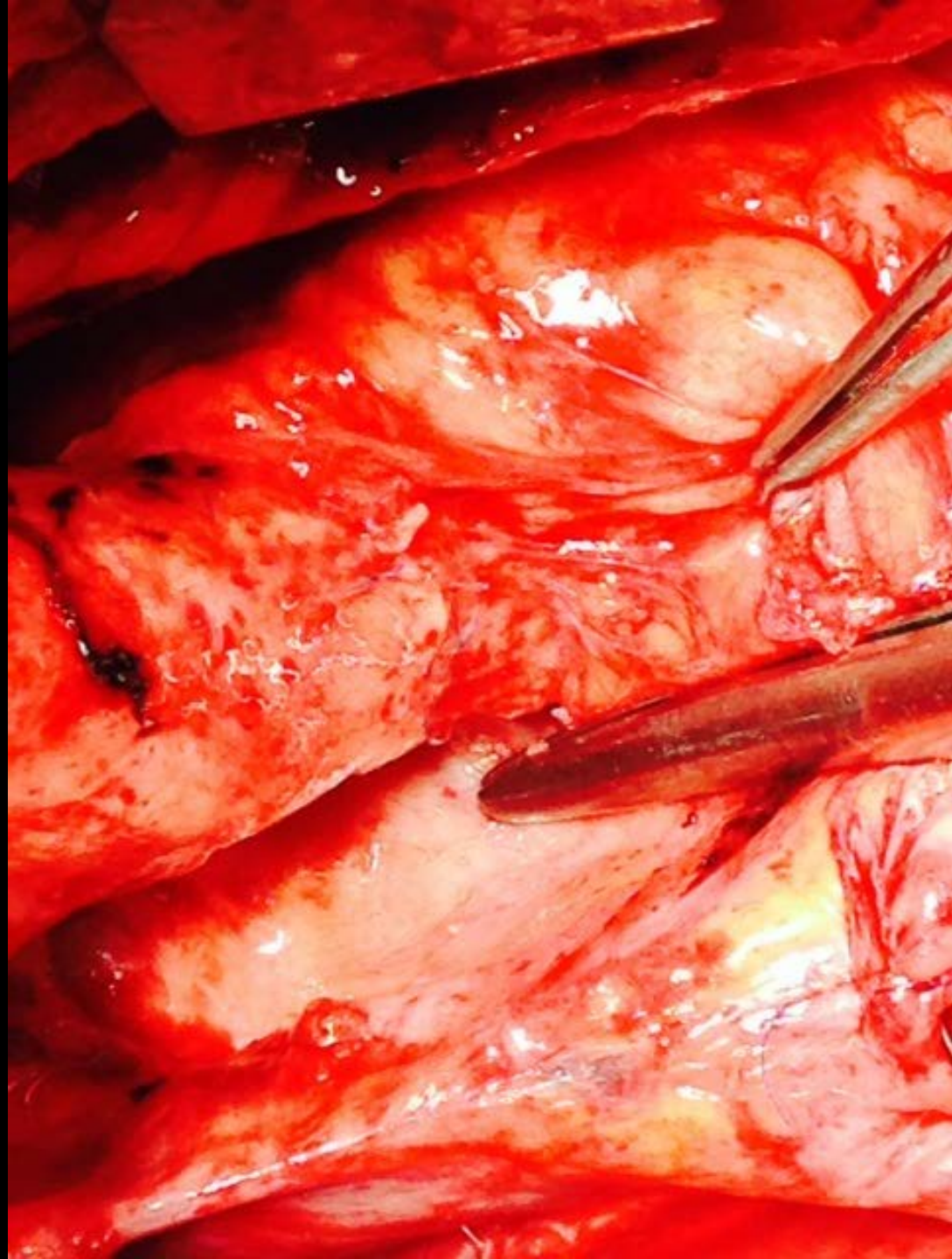
EMBF
S4-2
MI 1,6
TIS 0,7

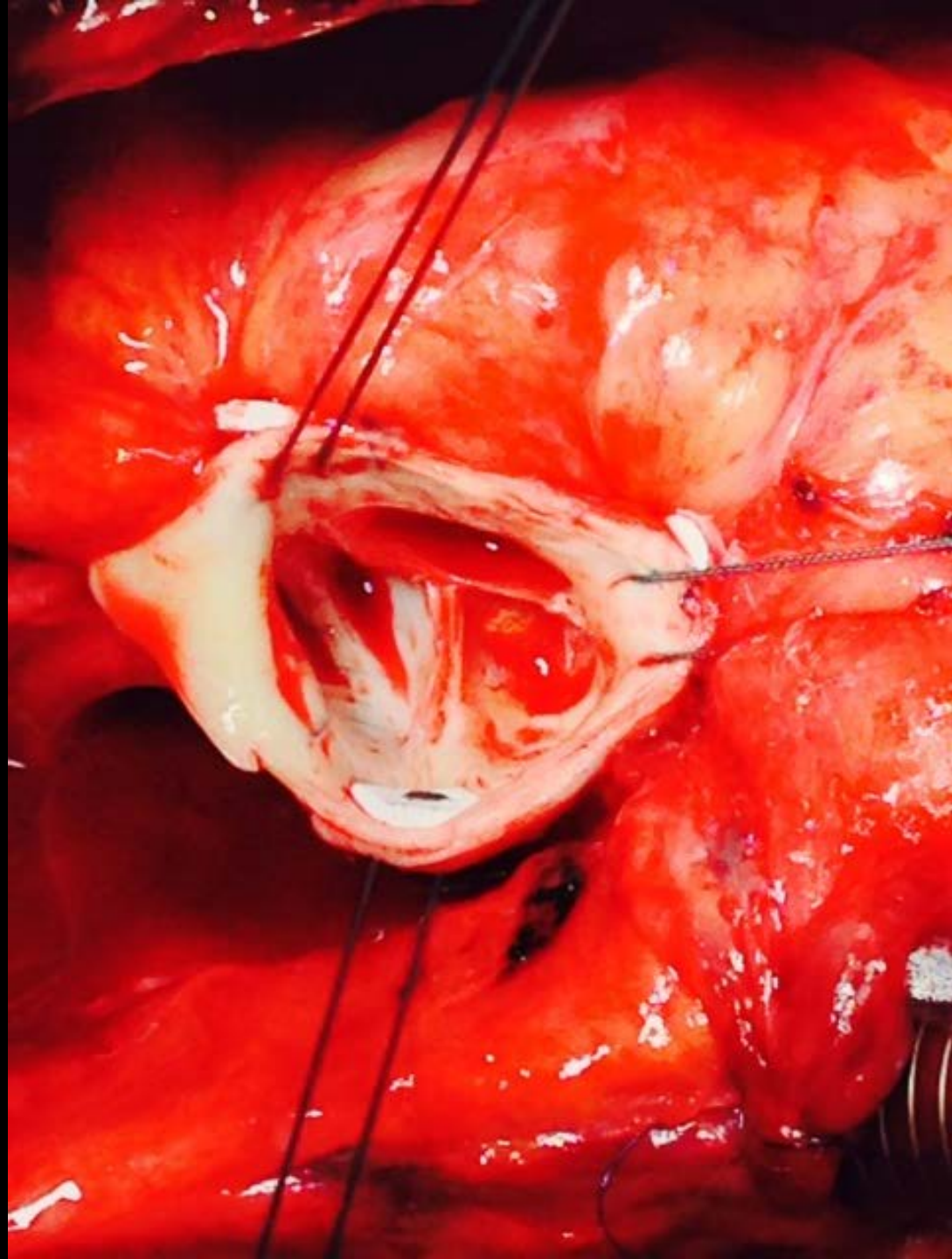
H3 Gn 23
232dB/C2
E/2/0

30Hz Zoom

T
P R
1,9 3,8



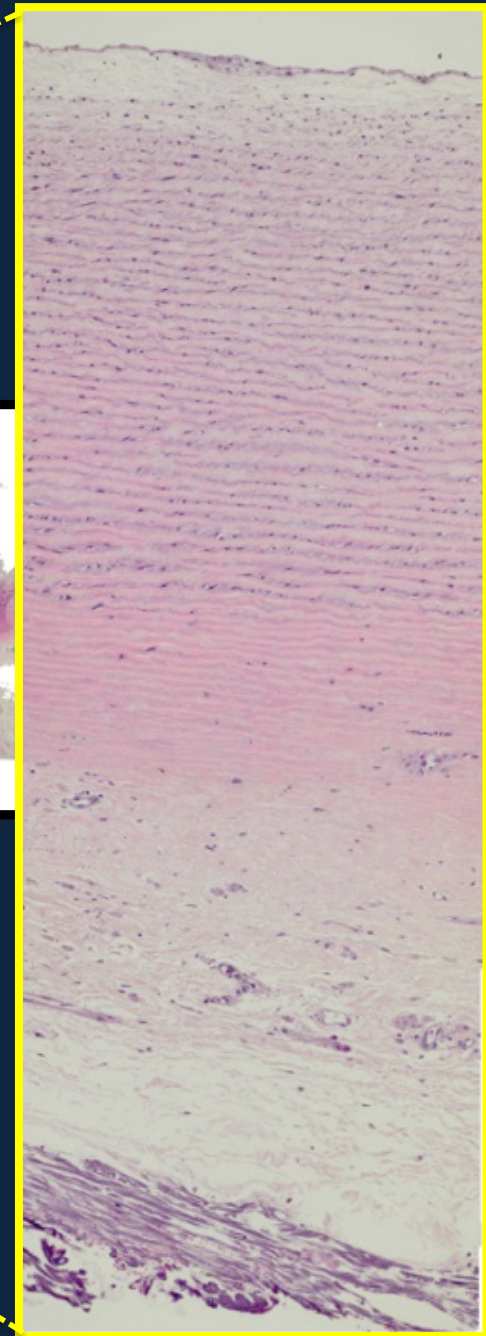
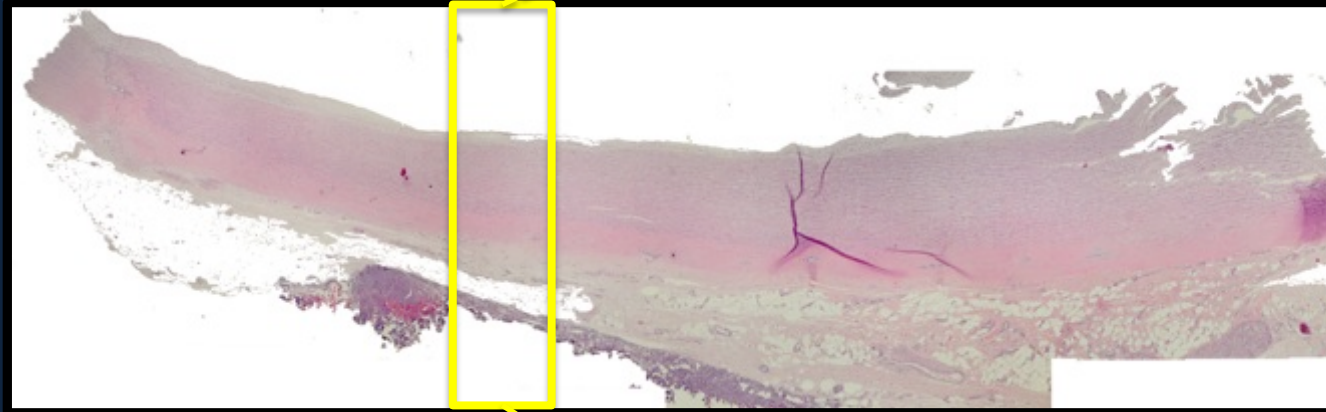




EXPLANTED AORTIC ALLOGRAFT

8 YEARS OF FOLLOW-UP

AORTIC WALL



- Well preserved aortic wall
- Elastic fibers intact
- "*in vivo*" repopulation
- Endothelization
- Minimal Intimal Hyperplasia

CUSP

B

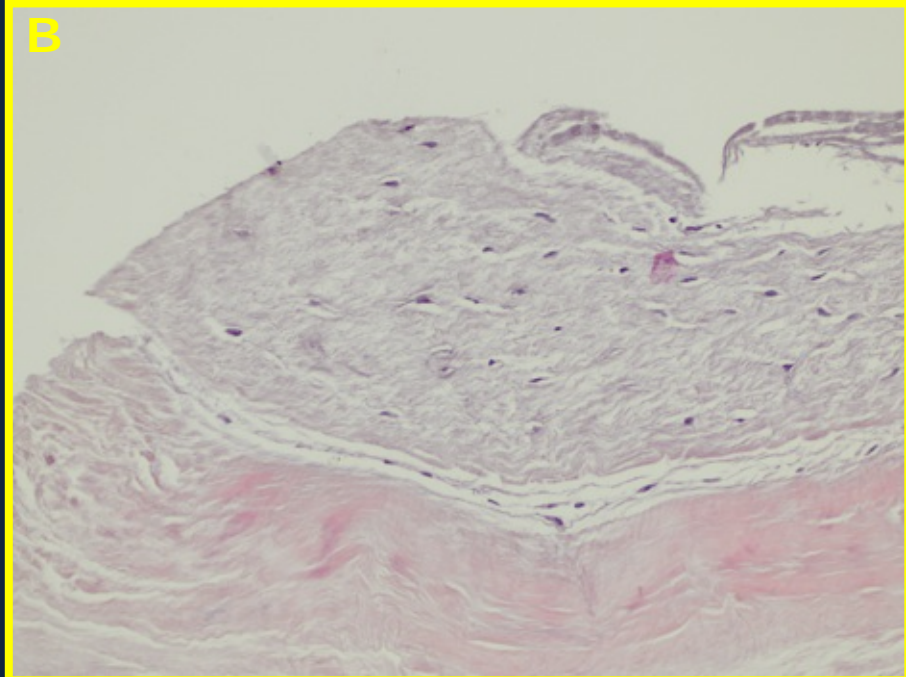
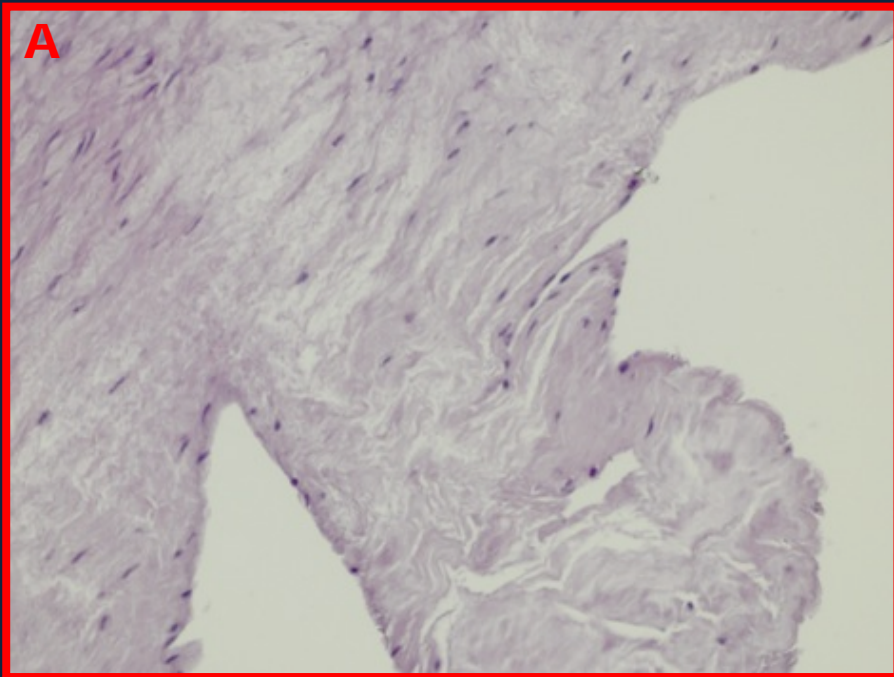
VENTRICULARIS

FREE MARGIN

FIBROSA

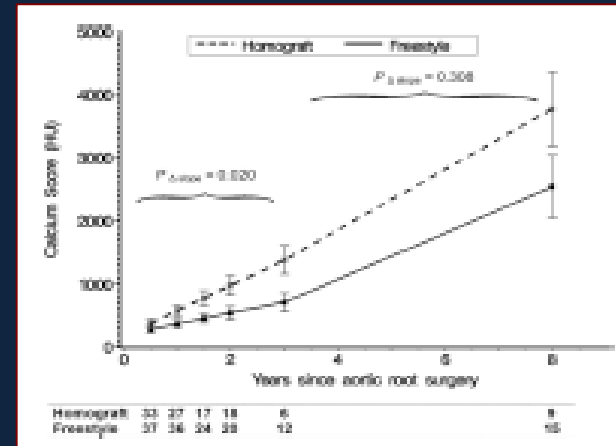
A

CUSP INSERTION

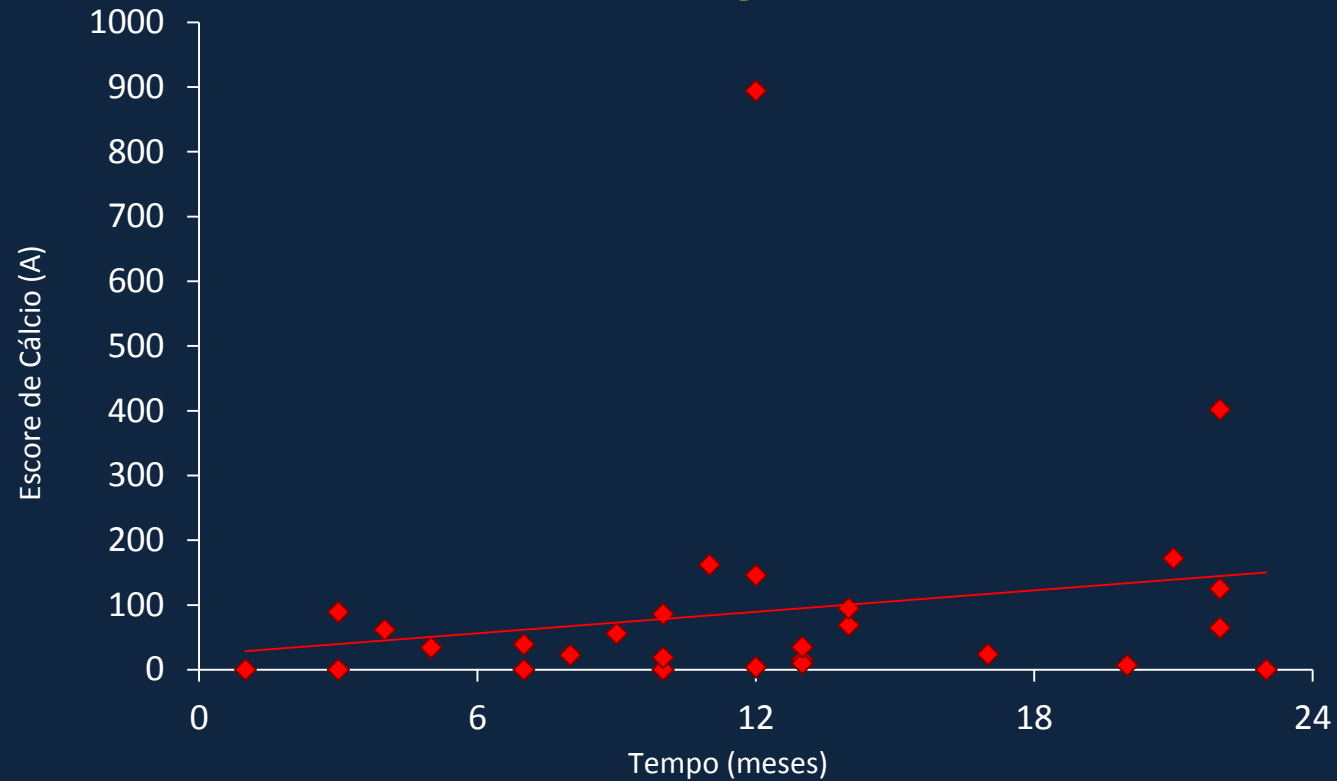


The Early and Midterm Function of Decellularized Aortic Valve Allografts

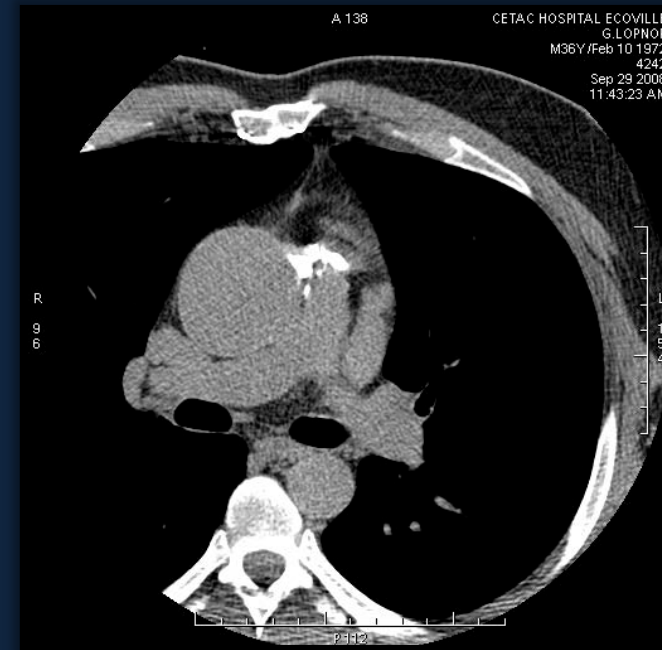
Francisco D. A. da Costa, MD, Ana Claudia B. A. Costa, Roberta Prestes, Ana Carolina Domanski, MD, Eduardo Mendel Balbi, MD, Andreia D. A. Ferreira, MD, and Sergio Veiga Lopes, MD



Decellularized Ao Allografts -Calcium Scores

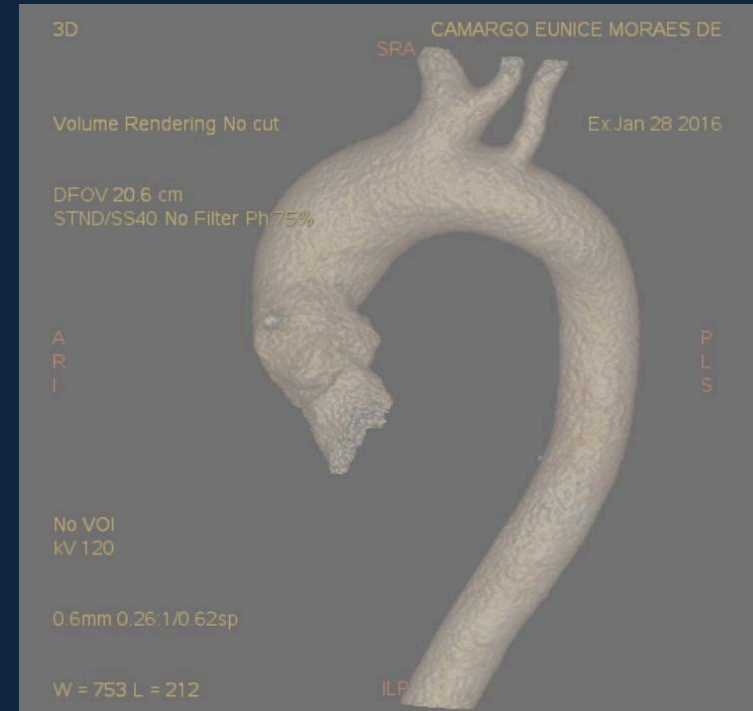


CT SCAN EVALUATION – CALCIUM SCORES –



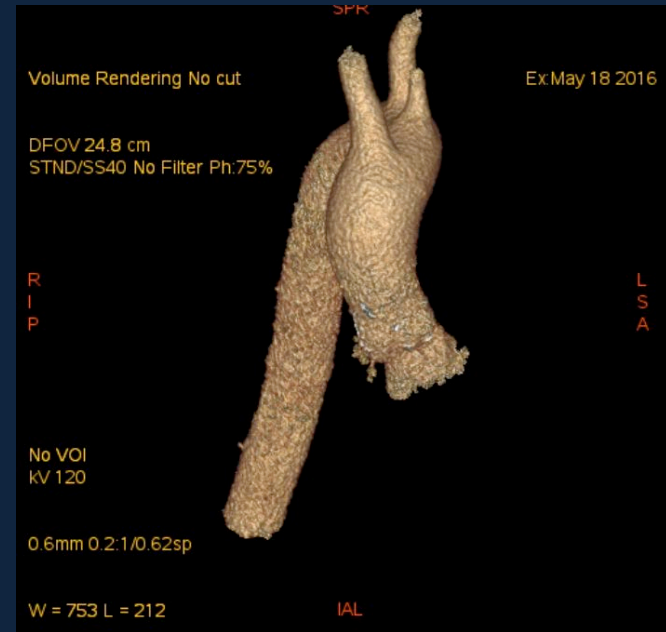
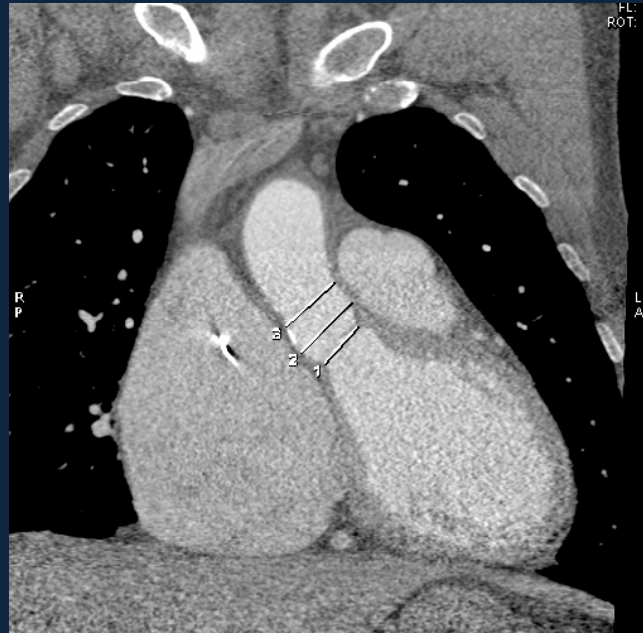
**ABSENT OR MINIMAL CALCIFICATION ON CUSPS AND
CONDUITS UP TO 2 YEARS OF FOLLOW-UP !!!!!**

CT SCAN EVALUATION – CALCIUM SCORES –



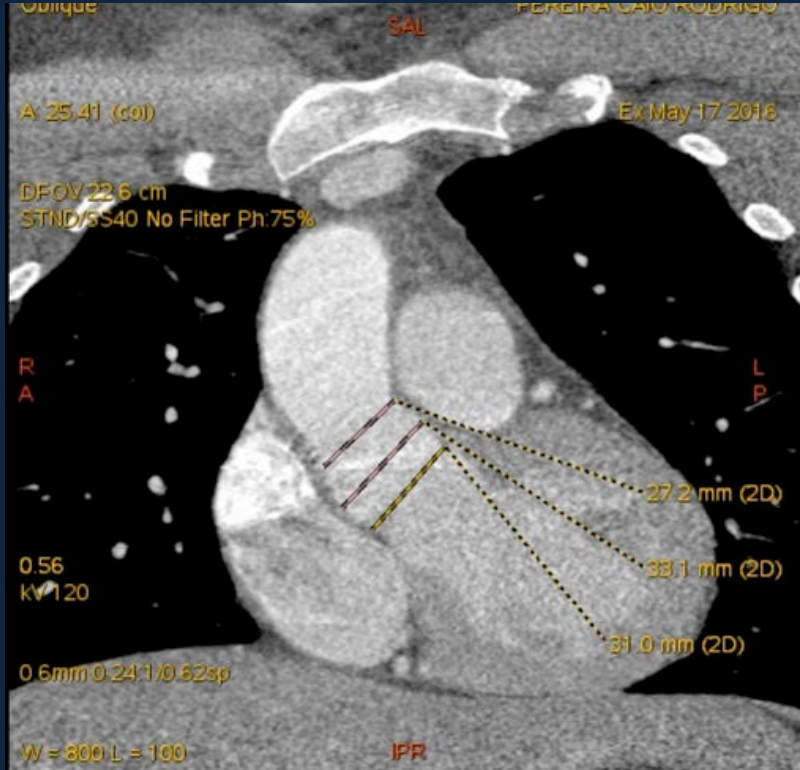
**ABSENT OR MINIMAL CALCIFICATION ON CUSPS
MILD – SPOTTY AREAS OF WALL CA AT 9 YEARS**

CT SCAN EVALUATION – CALCIUM SCORES –



**ABSENT OR MINIMAL CALCIFICATION ON CUSPS
MILD – SPOTTY AREAS OF WALL CA AT 8 YEARS**

CT SCAN EVALUATION – CALCIUM SCORES –



**ABSENT OR MINIMAL CALCIFICATION ON CUSPS
MILD – SPOTTY AREAS OF WALL CA AT 10 YEARS**

CONCLUSIONS

- Decellularized Aortic Allografts have demonstrated promising results up to 10 years of follow-up
- Hemodynamic performance is optimal, with low gradients and no or minimal regurgitation at short and mid-term follow-up
- Decellularized allografts appears to be very resistant to infections
- Decellularized aortic valve cusps appears very resistant to calcific degeneration. On the conduit wall, spotty areas of calcification are frequently seen after 5 years of follow-up.
- There were no documented cases of aneurysmal dilatation of the allograft up to 10 years.
- Longer follow-up is still necessary to determine the merits of this new technology.



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