TCT Asia Pacific
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Next Generation on PAVR Technologies

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Disclosure Statement of Financial Interest

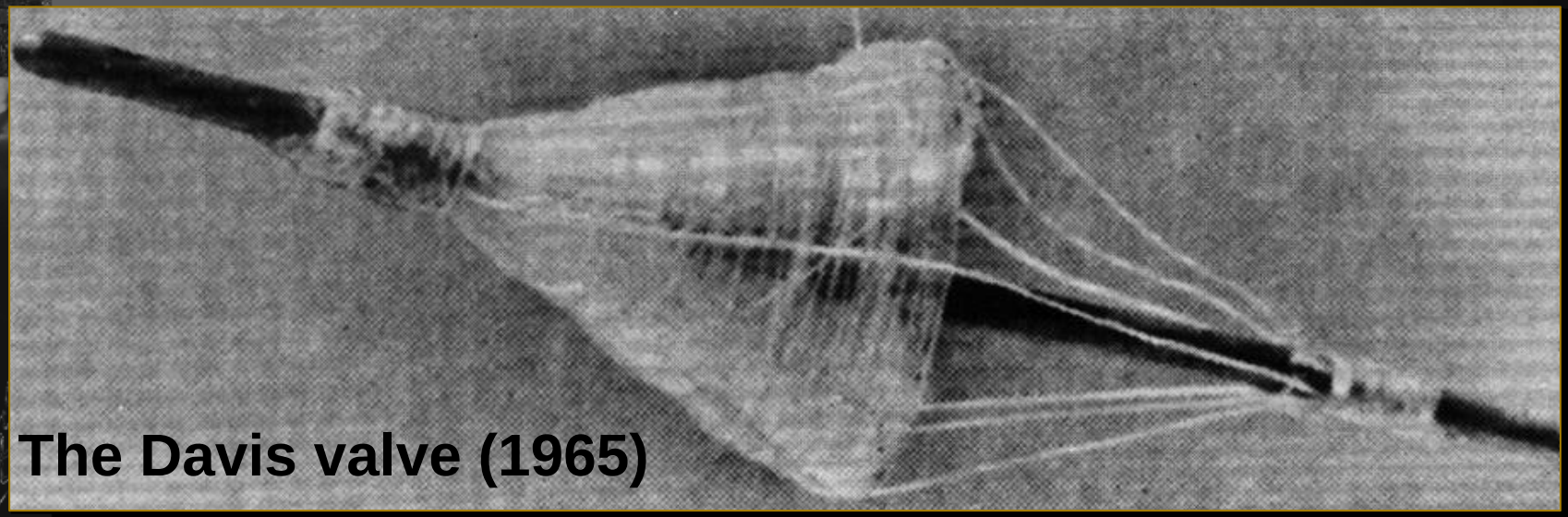
Within the past 12 months, the presenter or their spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Physician Name	Company/Relationship
Eberhard Grube, MD	Direct Flow (C) Core Valve(C, G, SB, E,) SADRA Medical (C, SB, E) Boston Scientific (G,C,SB) Cordis JnJ (C) Abbott (C)

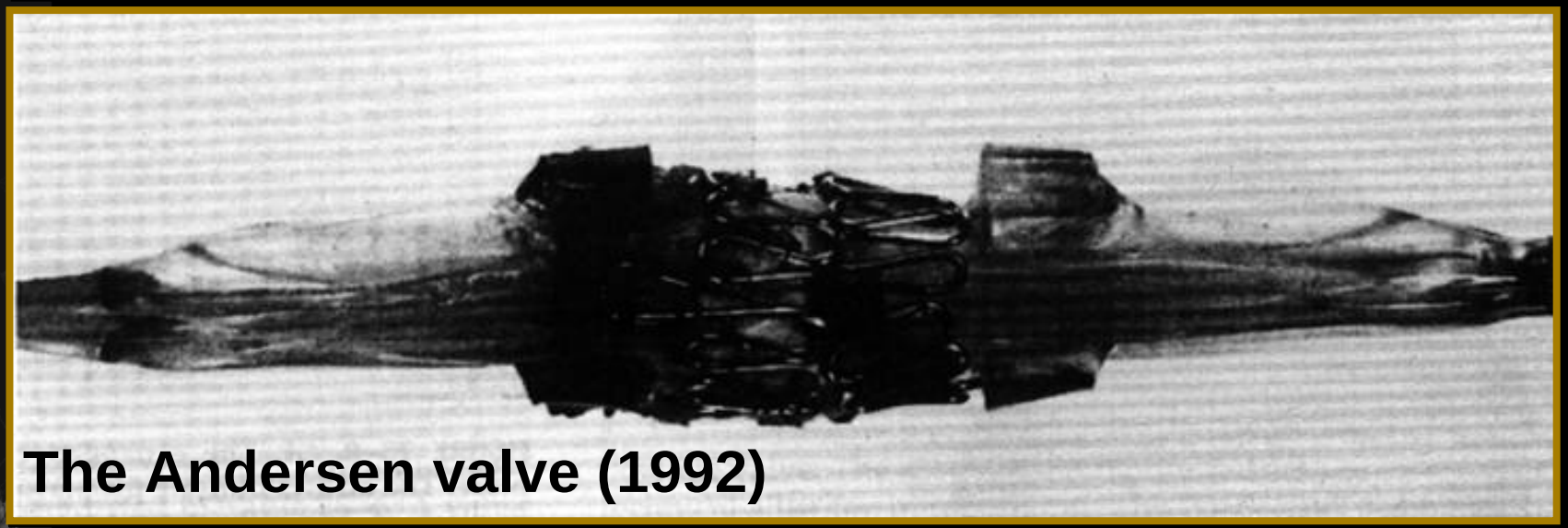
Key

G – Grant and or Research Support
C – Consulting fees, Honoraria
SB – Speaker's Bureau
E – Equity Interests
R – Royalty Income
O – Ownership
S - Salary
I – Intellectual Property Rights
OF – Other Financial Benefits

Early Catheter-Based AV Designs



The Davis valve (1965)



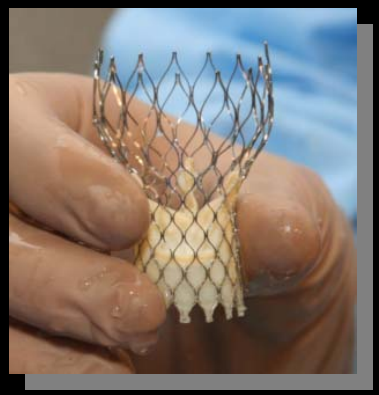
The Andersen valve (1992)

Evolution of Aortic Valve Implant

2002 2004 2006

First aortic transcatheter Implant via antegrade Approach
A. Cribier

First aortic Implant of the CoreValve via retrograde Approach
JC.Laborde, E. Grube



First percutaneous CoreValve Implant without Circ.Support
E. Grube, U. Gerckens

Transcatheter AVR
Clinical Data Sources

Edwards		CoreValve
Transseptal Experience (RECAST, I-REVIVE; 36 pts)	*FIRST-in-MAN*	25 Fr Transfemoral Experience (14 pts)
REVIVE (OUS, TF, 106 pts) TRAVERCE (OUS, TA, 172 pts) REVIVAL (US, TF/TA, 95 pts)	*FEASIBILITY*	21 and 18 Fr Transfemoral OUS Experience (177 pts)
PARTNER EU (OUS, TF/TA 125 pts) SOURCE (OUS, TF/TA, 598 pts)*	*CE-APPROVAL*	18 Fr Transfemoral OUS Experience (1,243 pts)*
PARTNER FDA* (US/OUS, TF/TA 456 pts)	*PIVOTAL RCT*	PARVIS In Planning with FDA

* still enrolling patients

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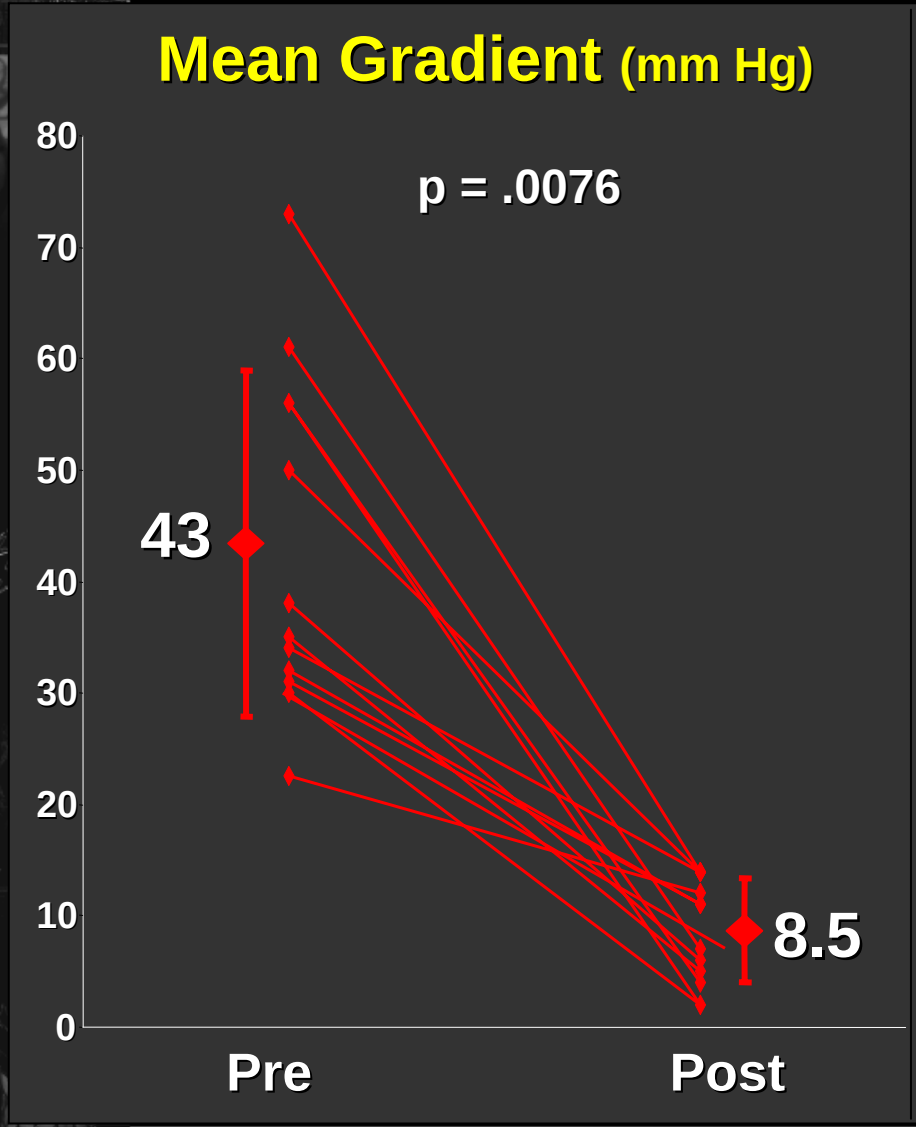
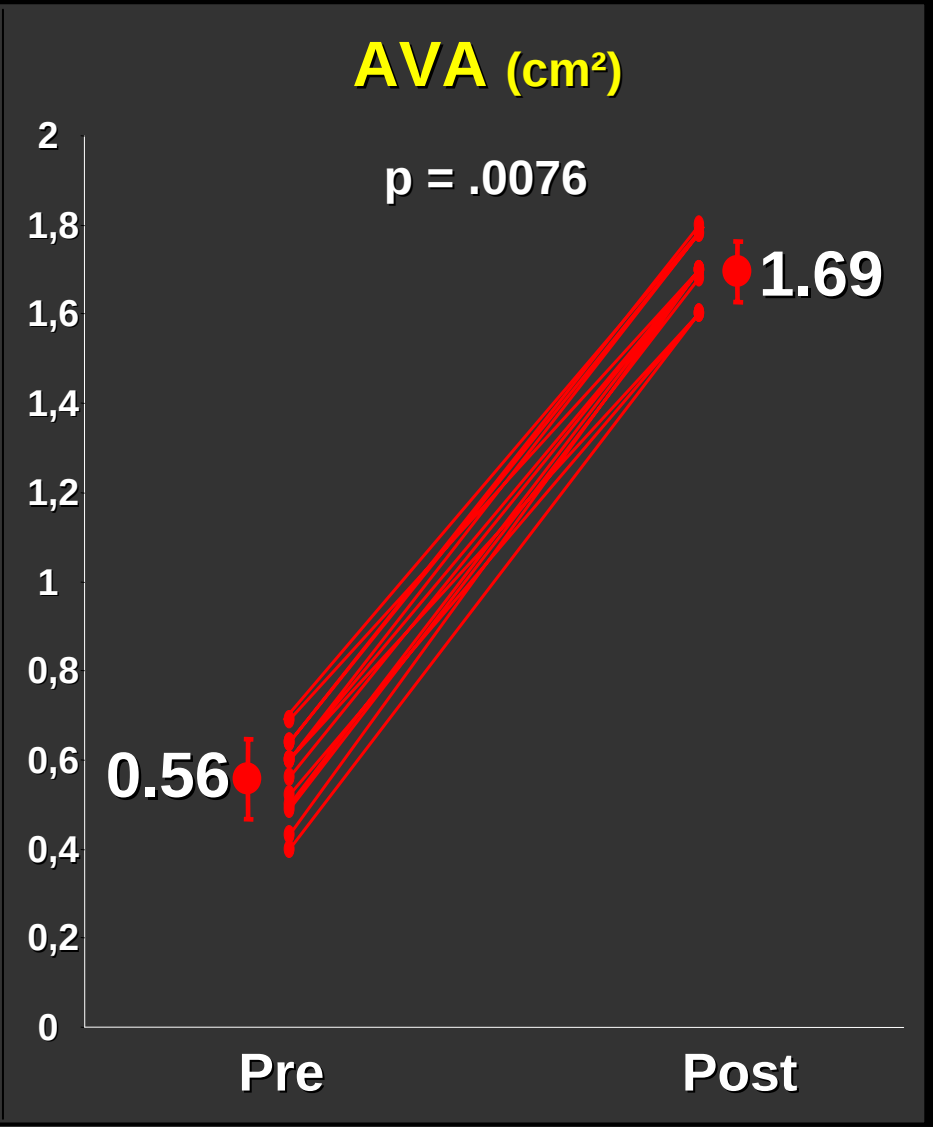
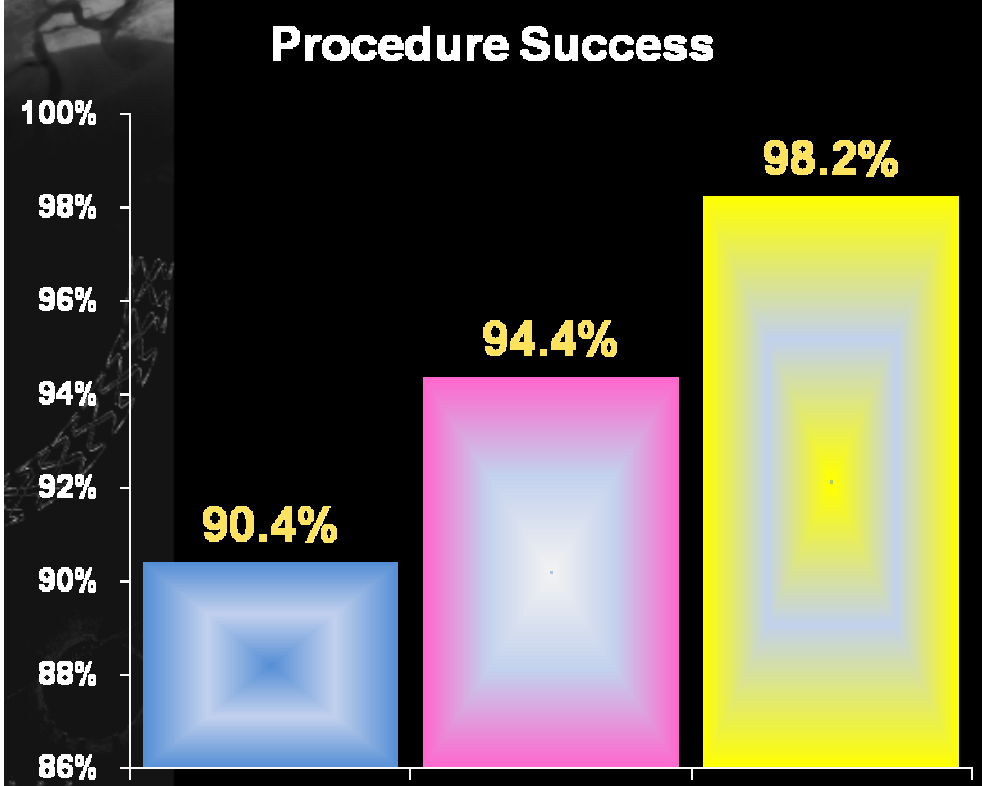
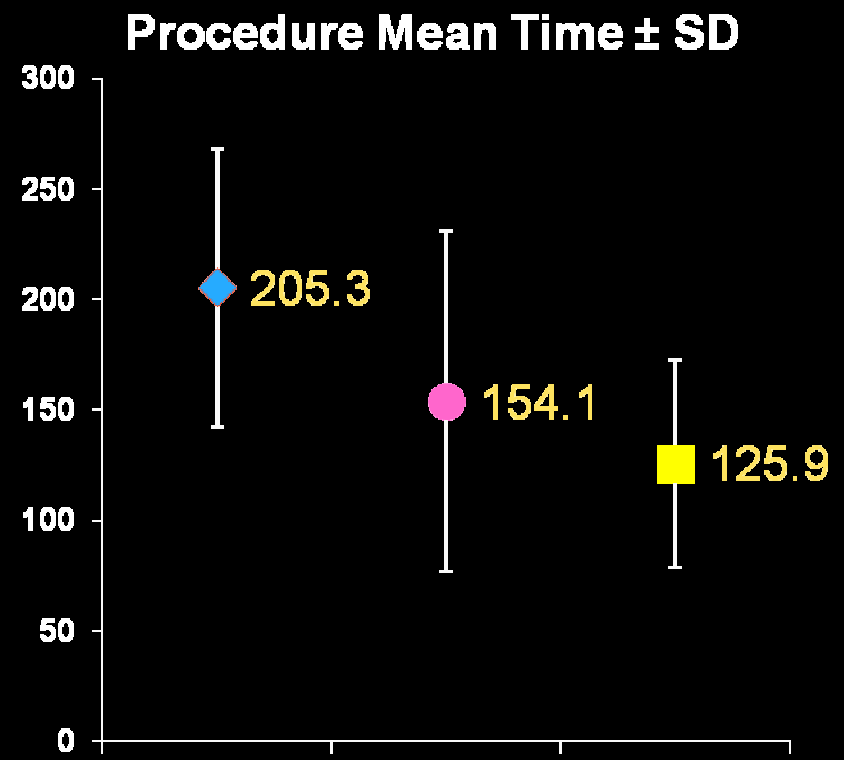
Cribier – Early PHV Experiences





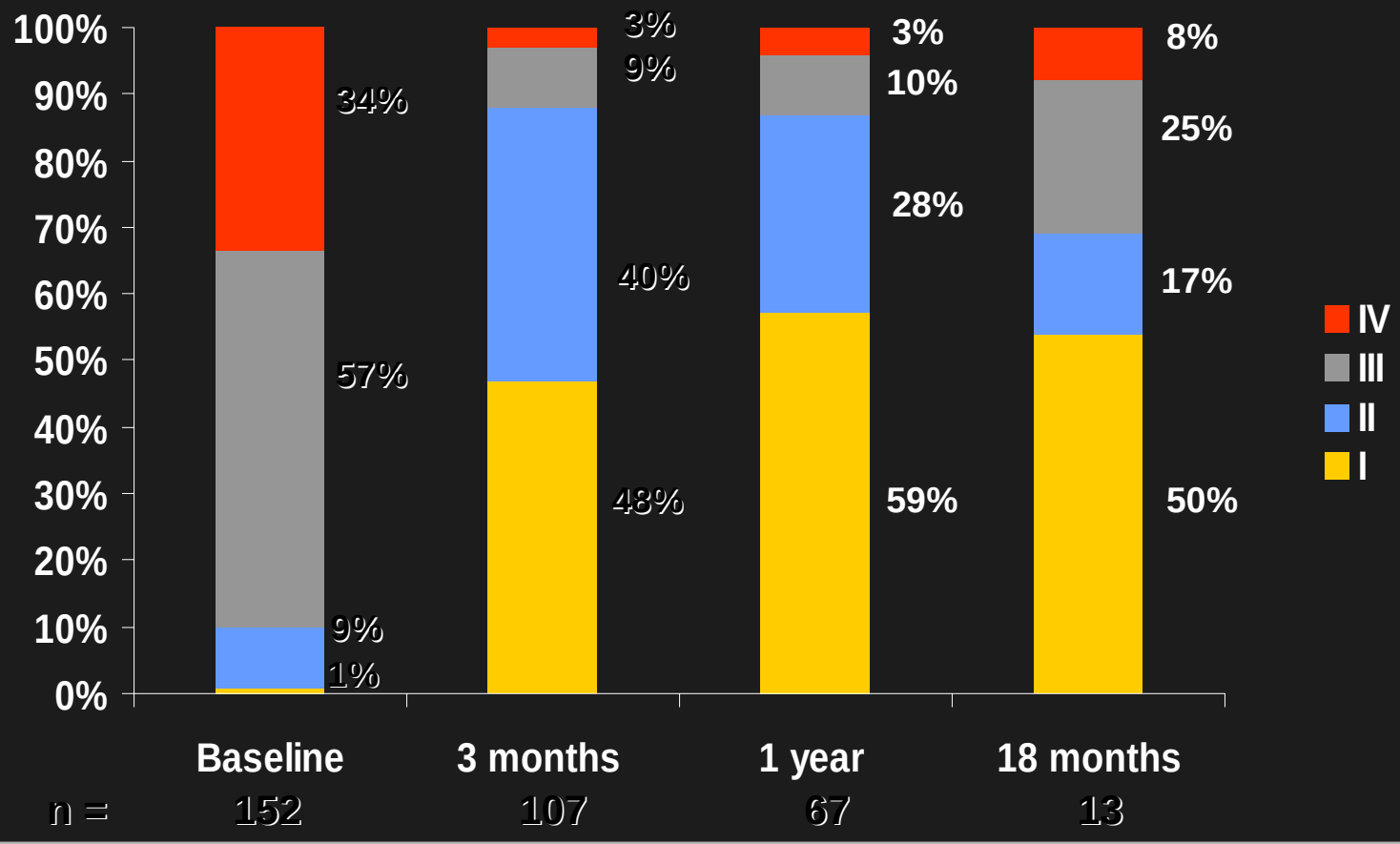
CoreValve Procedural Results





21F S&E 18F S&E 18F EE

REVIVE + REVIVAL
Changes in NYHA Class



90% patients at baseline NYHA Class III/IV,
87% of patients surviving to one year are NYHA Class I/II

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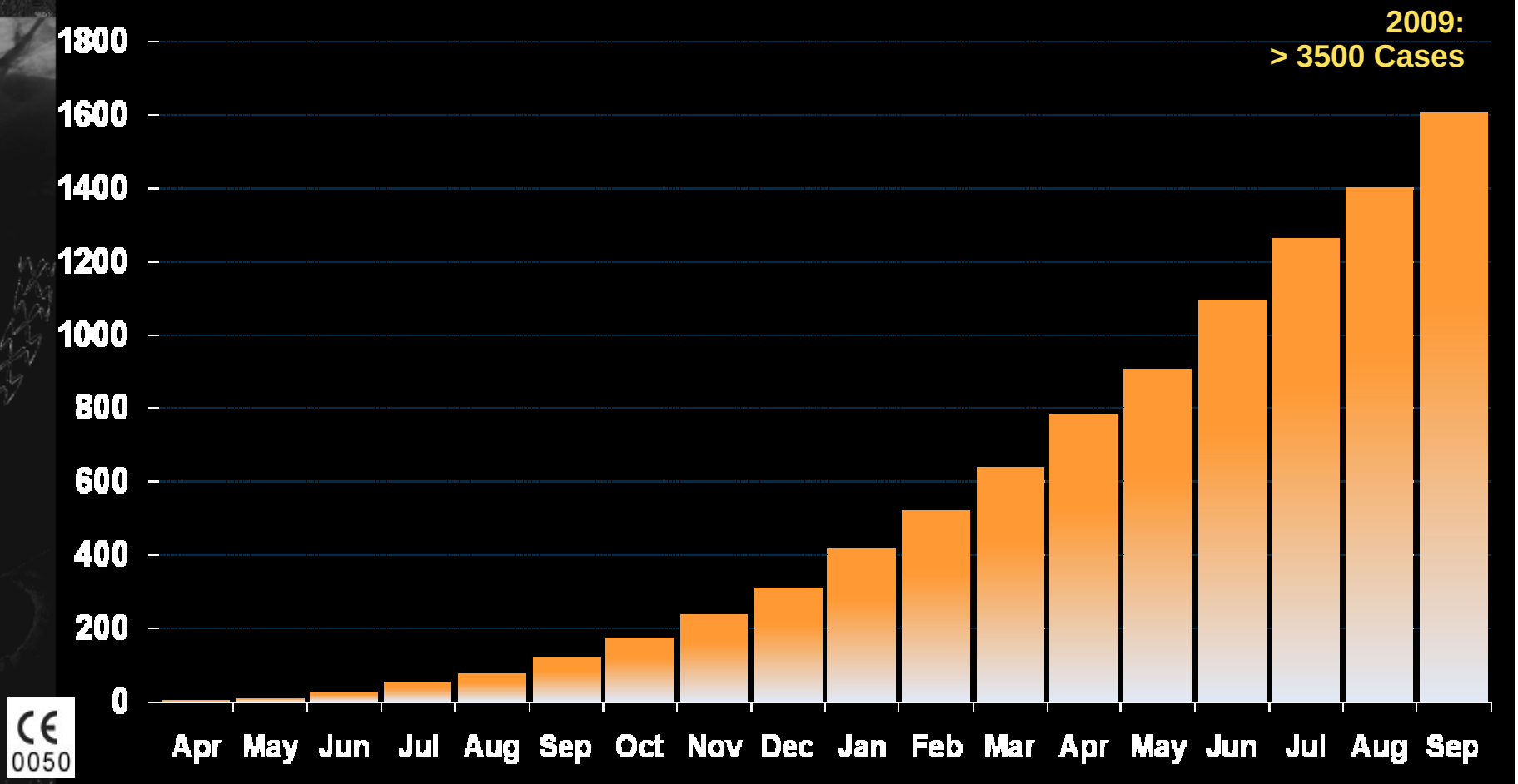
Post CE Mark Cumulative
18F *ReValving* PAVR Procedures



CE 0050

Updated 01-October-2008: ~100 sites in 20 countries

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Percutaneous AVR Needs

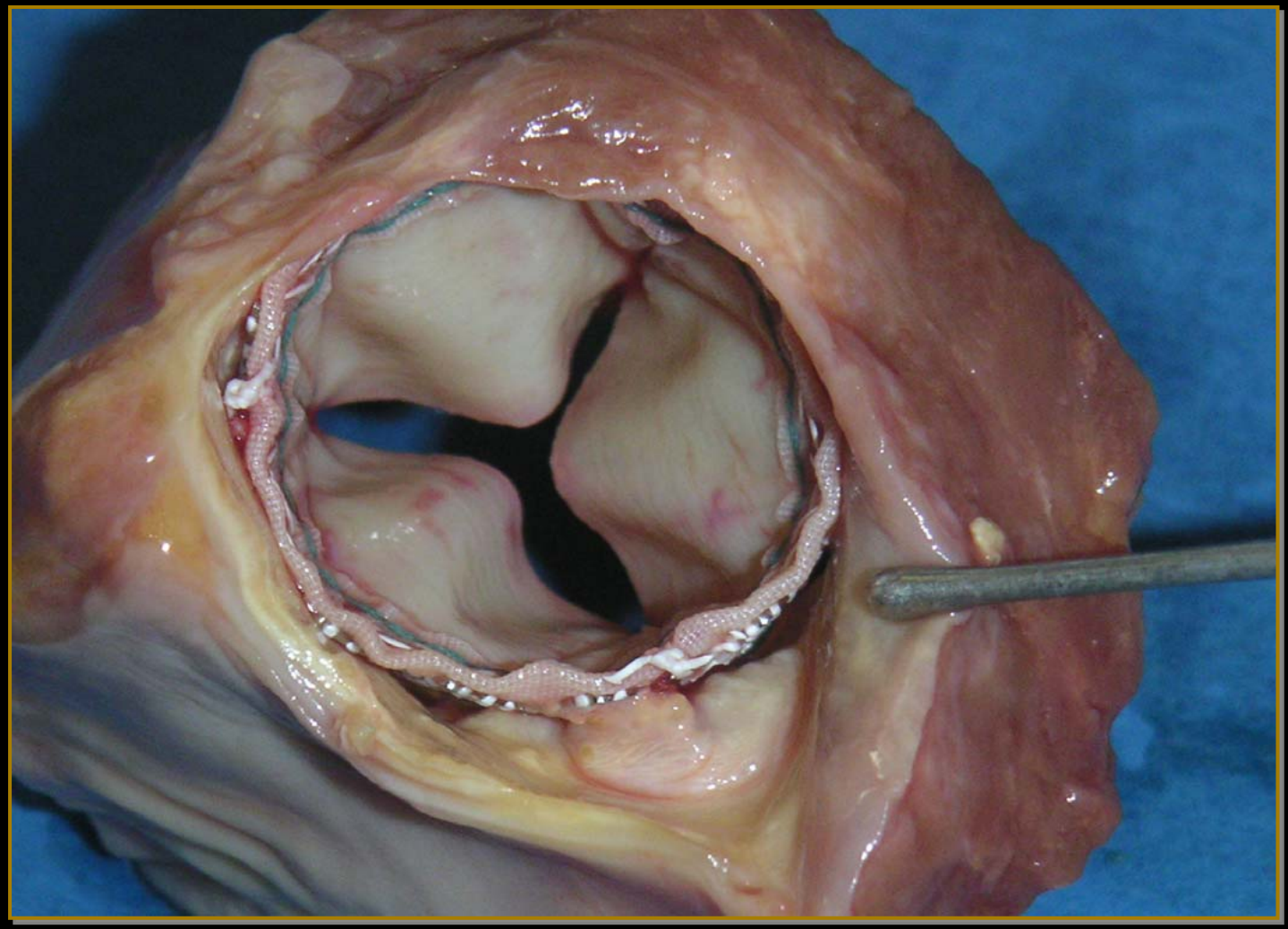
- **First Generation PAVR solutions:**
  - Have provided tremendous clinical benefit to over 5000 patients.
  - Confirm a compelling clinical need in high risk patients.
  - Highlight opportunities to make PAVR safer, easier to perform, with better outcomes for patients.
- **Current Devices:**
  - Have a steep, rel. unforgiving learning curve.
  - Are difficult to place with precision.
  - Cannot be repositioned to facilitate optimum placement.
  - Cannot easily be retrievedd in the event of mis-sizing or clinical need.
  - Are subject to perivalvular leaks, despite optimal placement and sizing.

‘Percutaneous Devices for Aortic Valve Replacement’

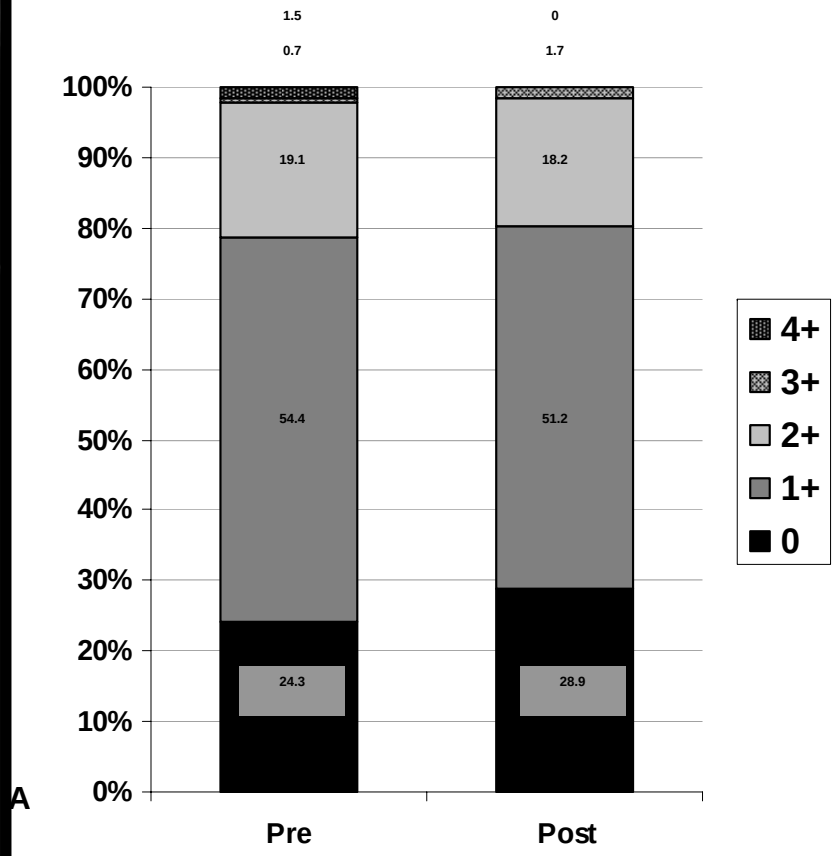
Potential problems of current devices

- Paravalvular leackage
- Inaccuracies in Positioning
- Embolization, Migration
- ‘One shot’ procedure

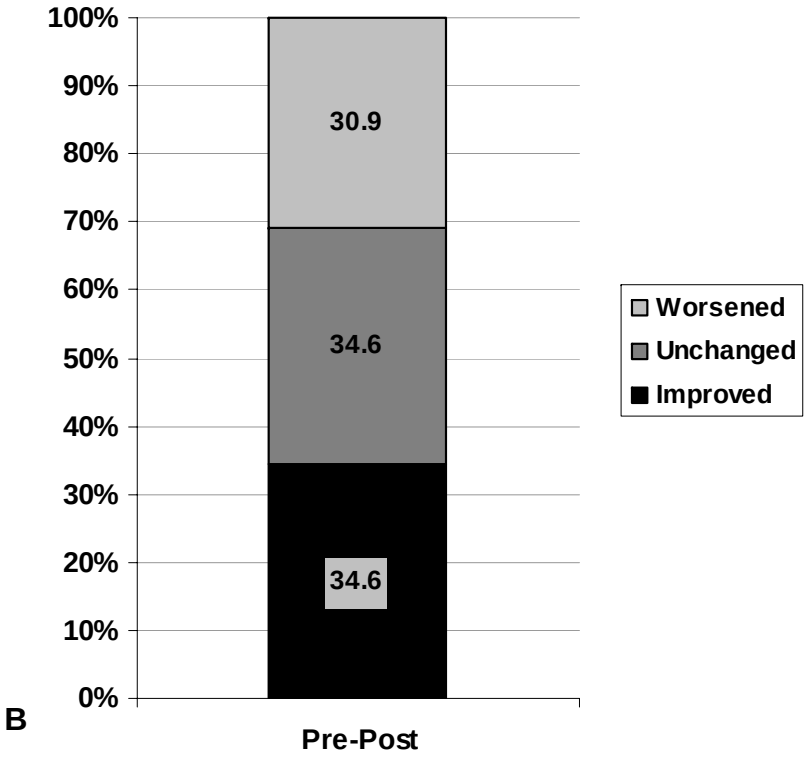
Para-valvular Regurgitation



CoreValve
Aortic Regurgitation post-interventional



A



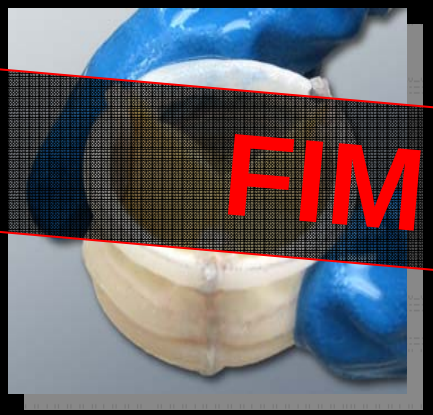
B

Percutaneous Aortic Valve Replacement
Most Advanced Techniques

CoreValve Prosthesis

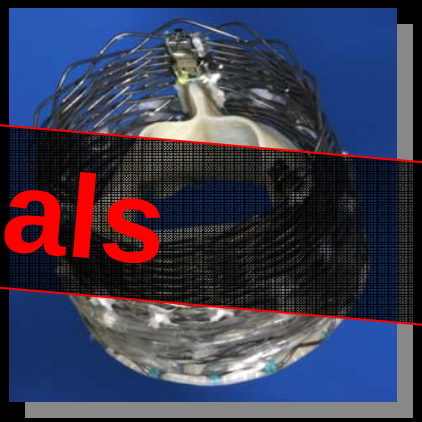
Edwards Prosthesis

CE Approved



Direct Flow Prosthesis

FIM Trials



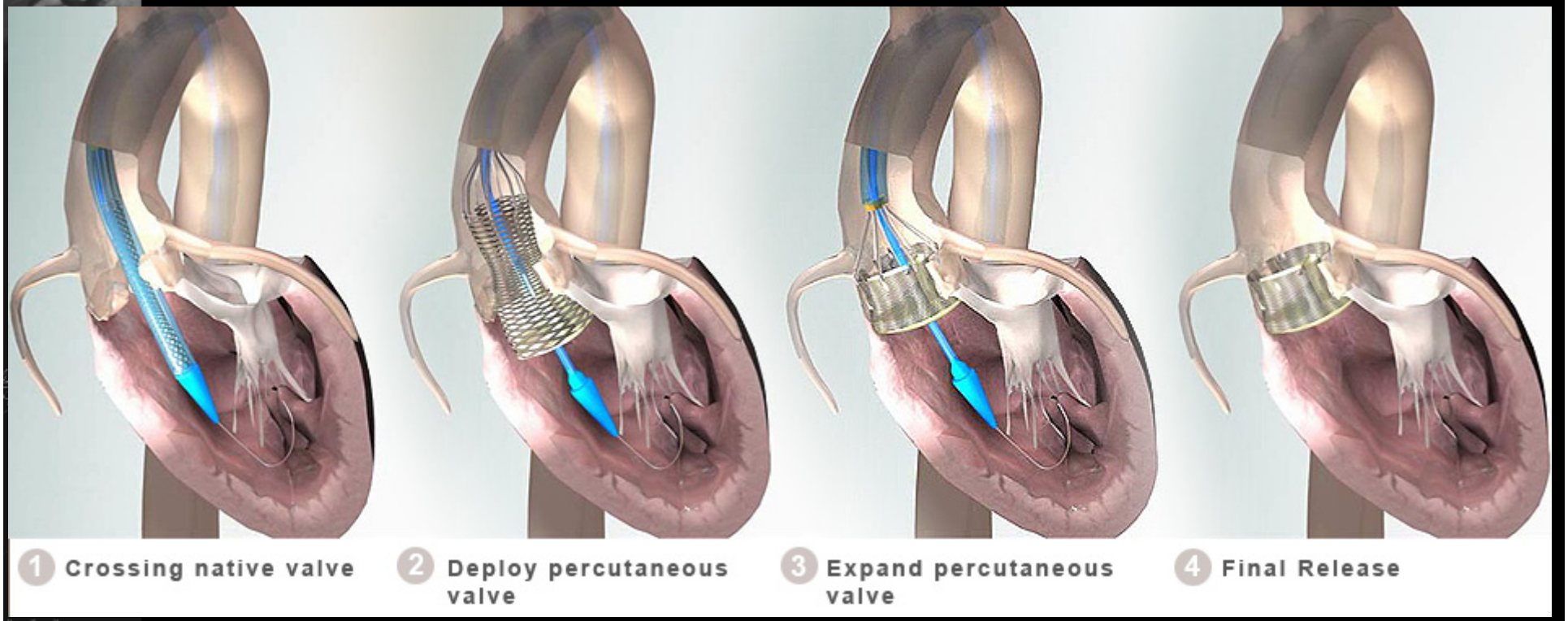
Sadra Prosthesis

Sadra Lotus™ Valve System

- Flexible, trackable for easier delivery.
- Controlled deployment with self-centering design facilitates accurate placement.
- Easily repositioned or removed.
- Adaptive seal to minimize perivalvular leakage
- Rapid deployment

Lotus Valve

At this point the device can be fully retracted, back to step 1, and repositioned



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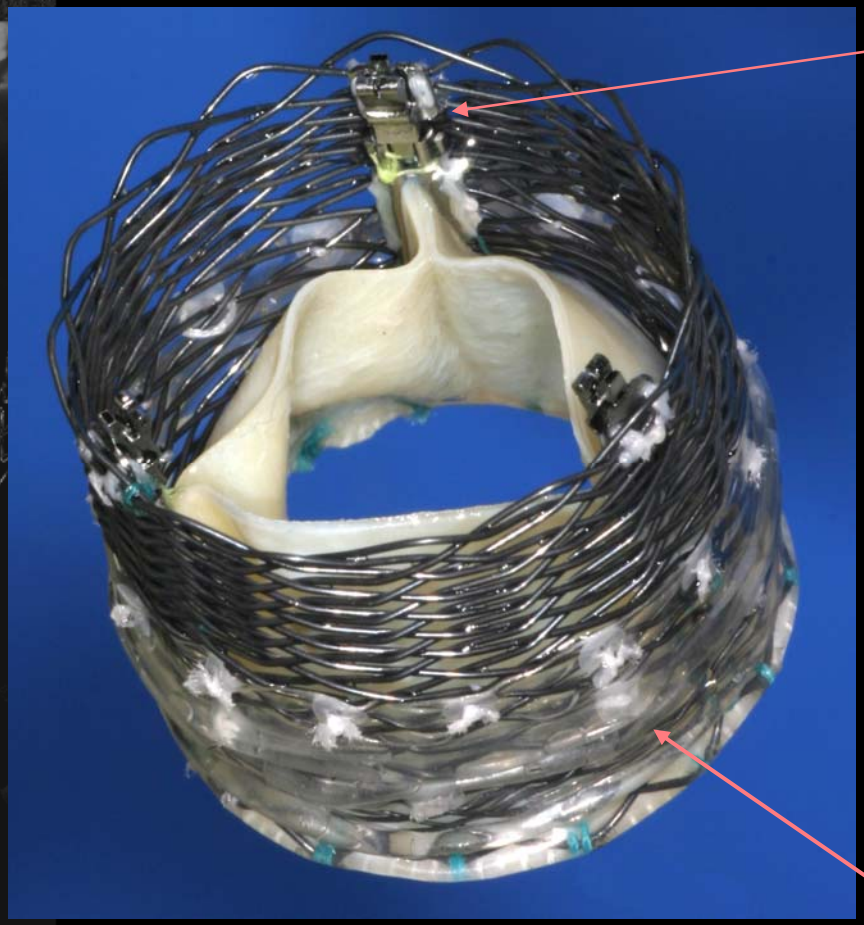
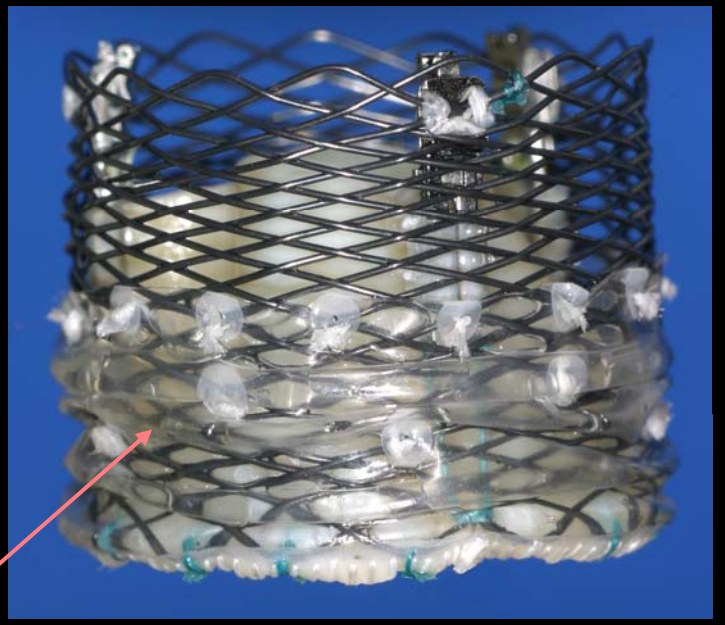
Sadra Lotus™ Valve System

The Sadra Lotus™ Valve - Device Features and Rationale

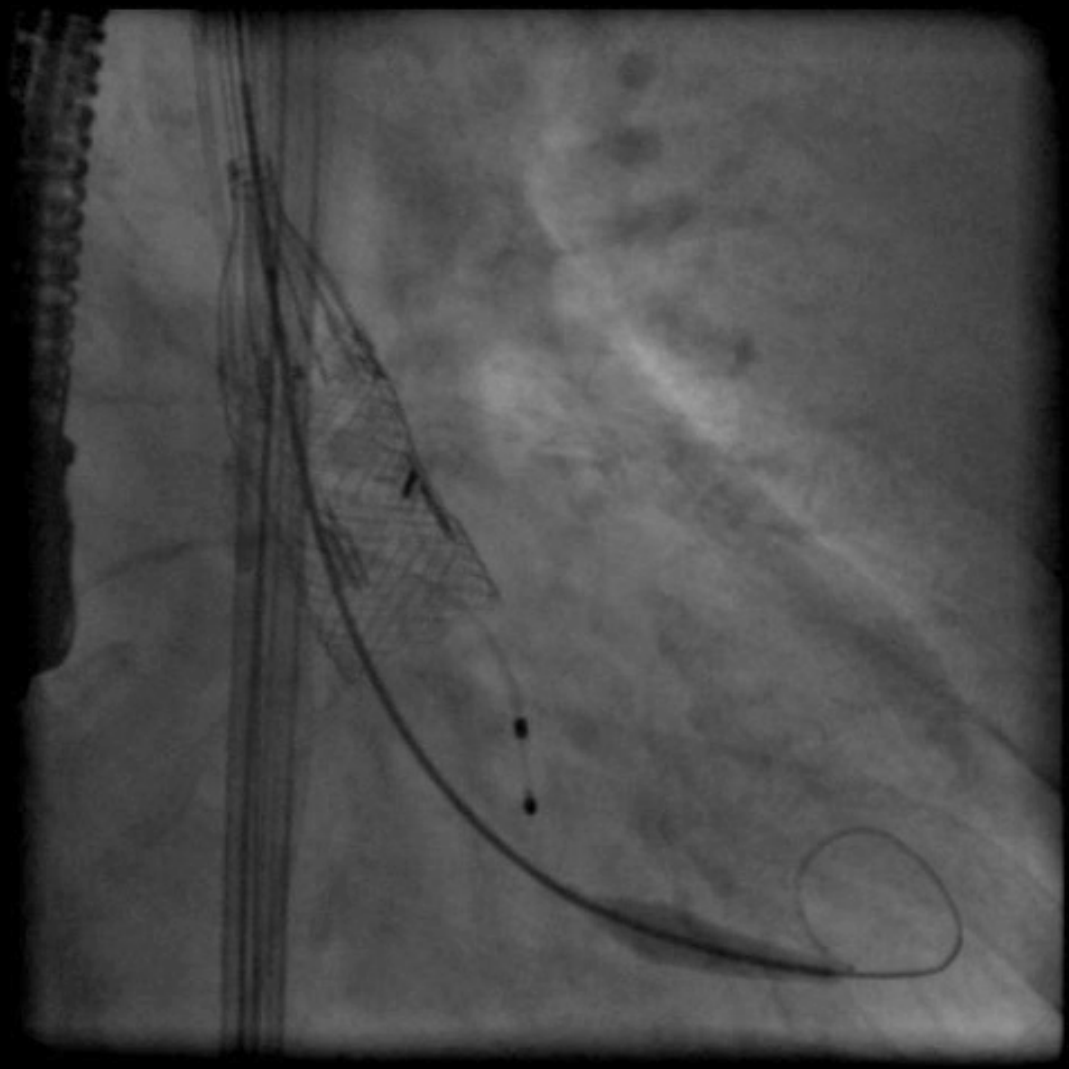


Locking mechanism

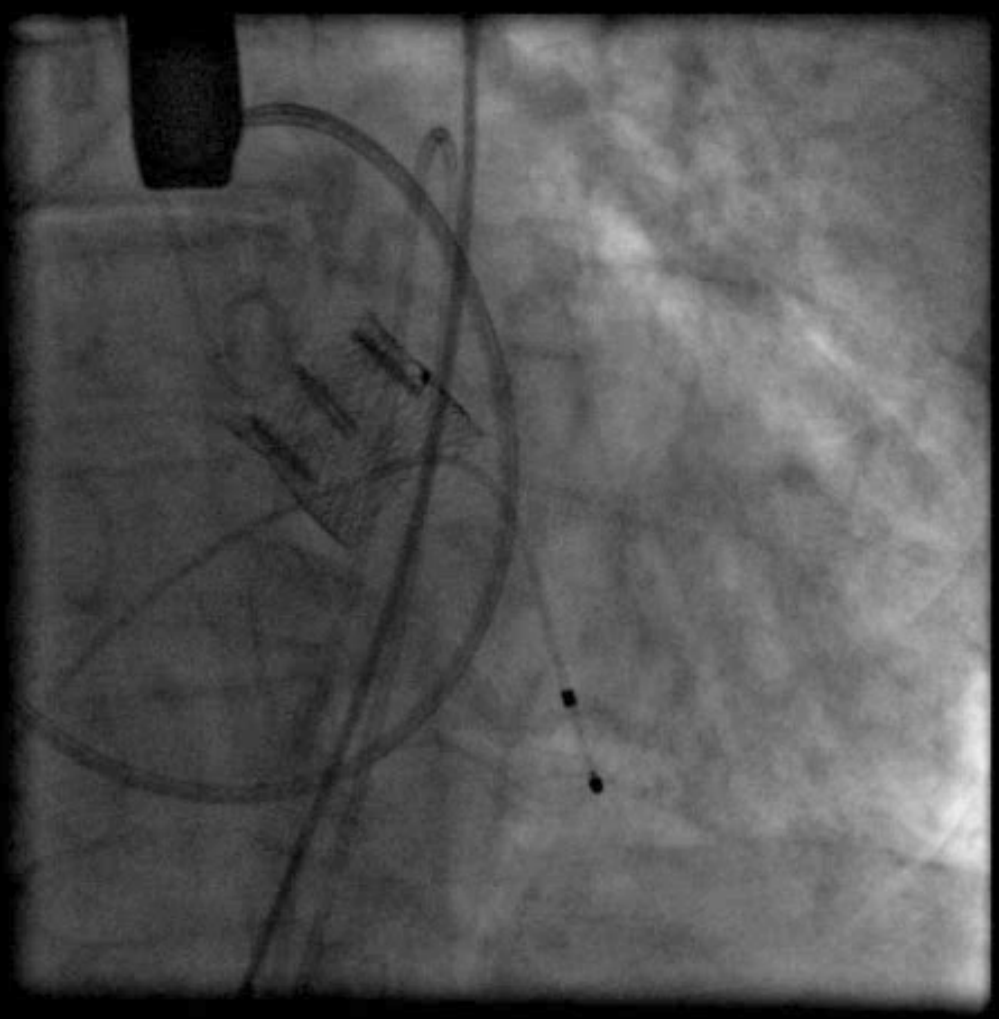


Adaptive™ Seal

Precise Positioning During Locking

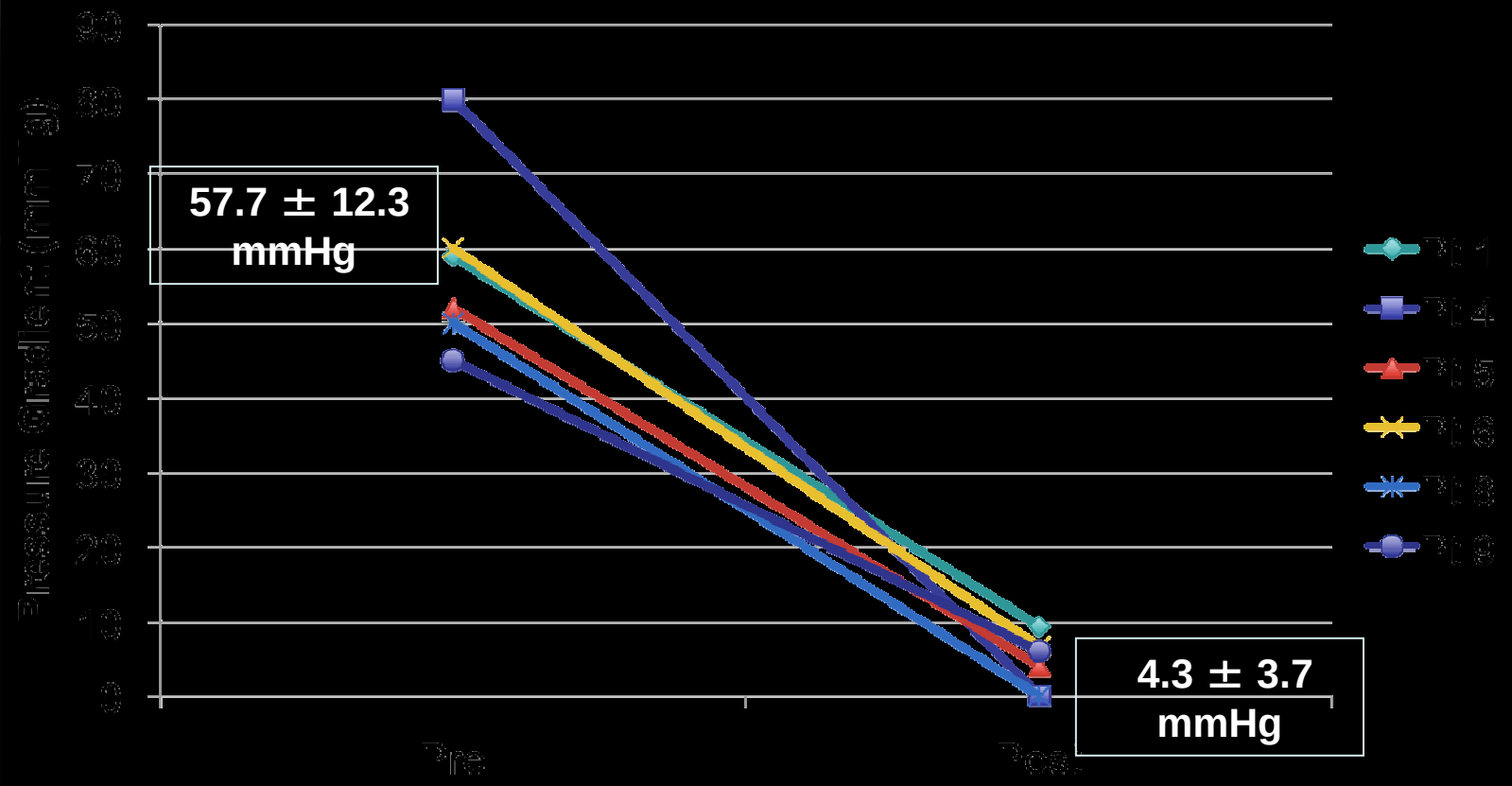


Final Result – Excellent Placement & Zero Leakage

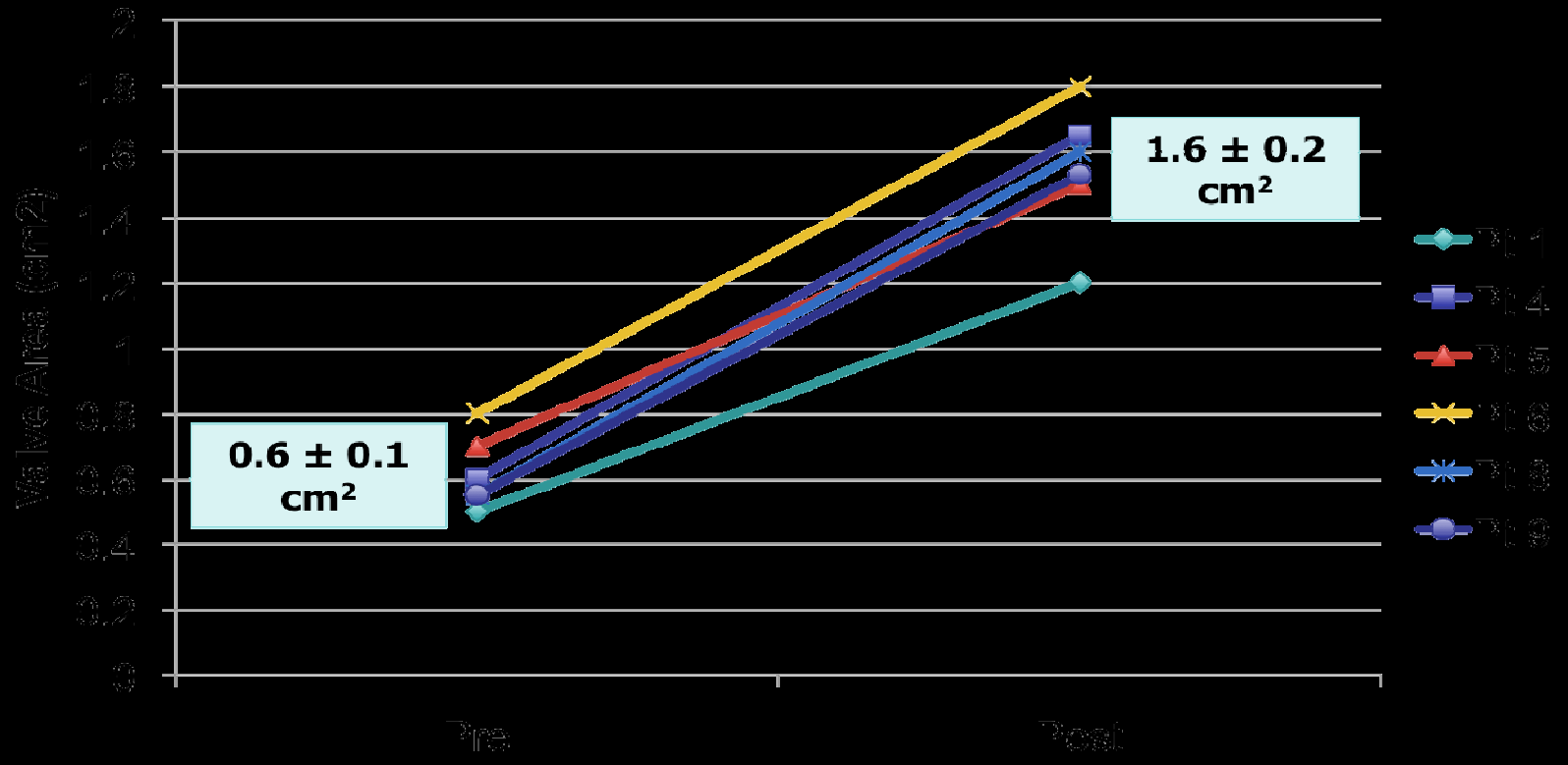


Simplified Attachment (Next generation)

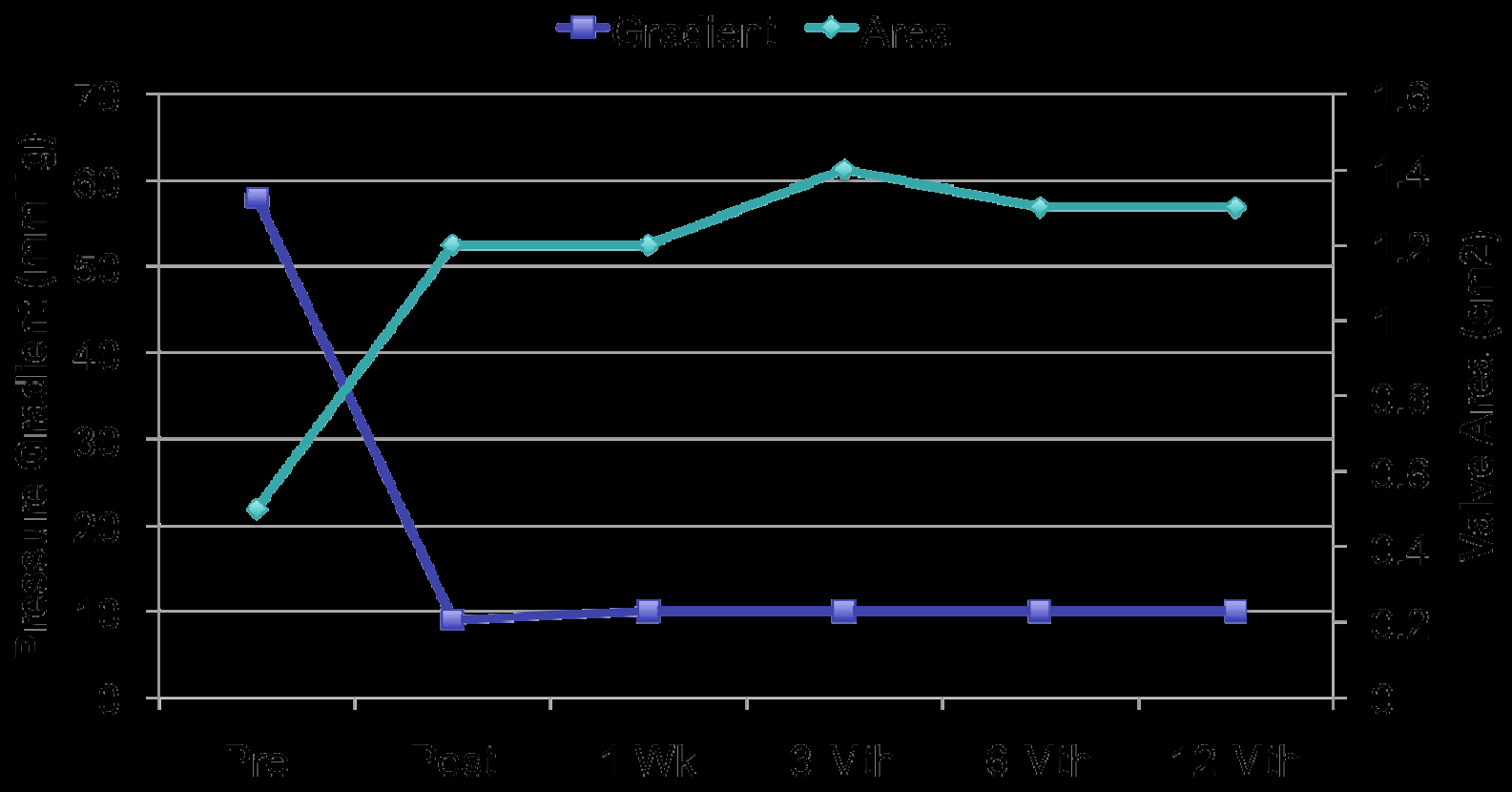
Pressure Gradient – Pre & Post Procedure



Valve Area – Before & After Procedure



Patient 1 Follow-Up



Case Experience - Summary

- Sadra Lotus Valve performs as intended.
- System facilitates accurate positioning and placement.
- Repositioning is a valuable performance feature.
- The valve can be retrieved if needed.
- Procedure is efficient – range 12-25 minutes.
- Valve hemodynamics are good – minimal to no perivalvular leak.

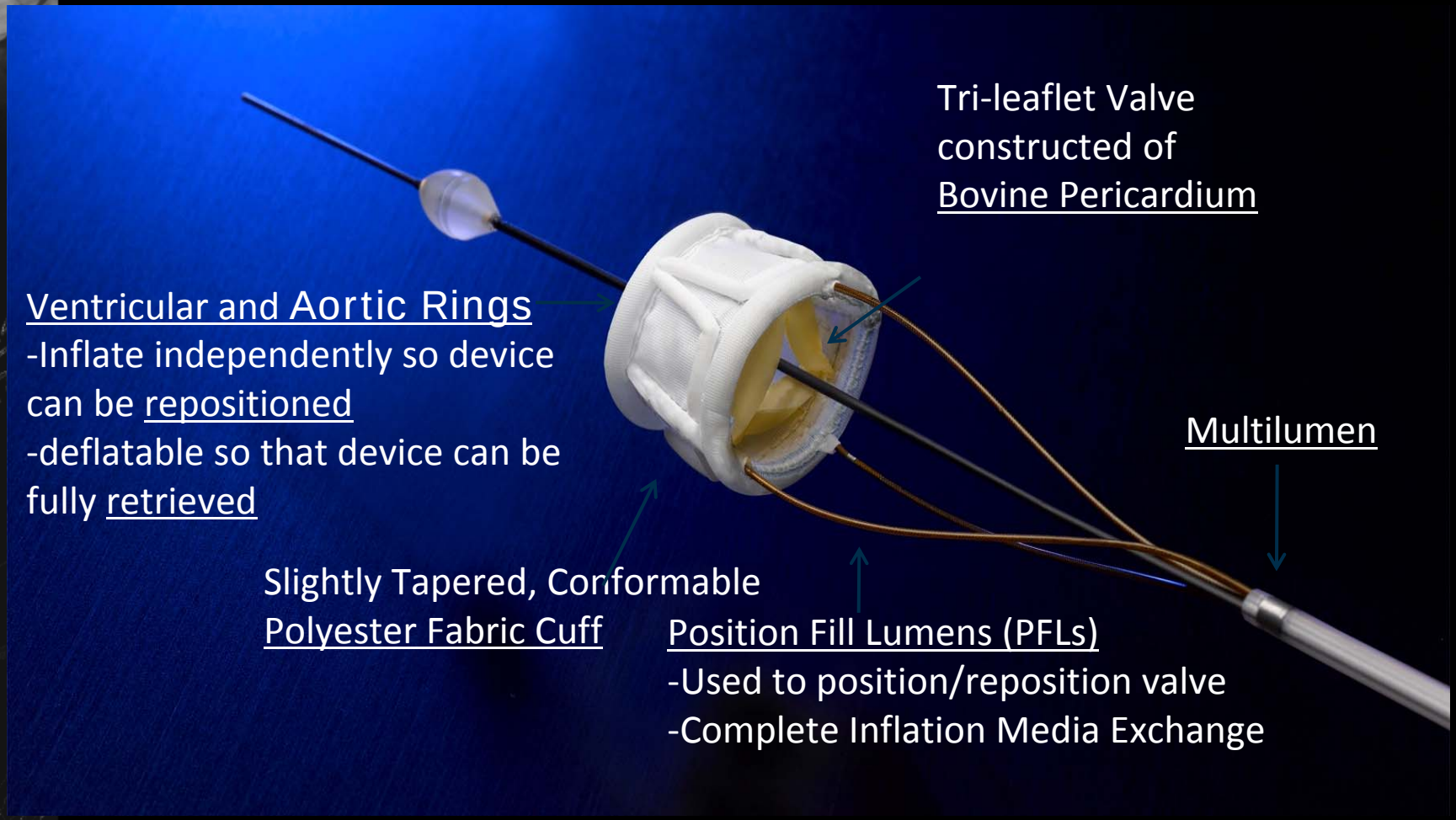
Clinical Experience

Number of Patients Enrolled	8
Gender	75% Female
Age	83.3±5.9 years
EuroScore (n=6)	18.4%±7.0% (9.7 - 28.9%)
STS Score (n=6)	10.4%±6.1% (2.3 - 22.1%)
Common Pre-existing Conditions	COPD, Hypertension, hyperlipidemia, CHF, mitral valve disease
Pre-op Annulus Diameter (per CT) (n=6)	19.5±1.8 mm (17 – 23)
Pre-op Peak Gradient (n=8)	60.2±11.9 mmHg (50 – 80)
Pre-op AVA	0.63±0.12 cm^2 (0.5 – 0.8)

Clinical Data Summary - Patient Outcomes

Number of enrolled patients	8
Operative Mortality during Sadra device procedure	1 – Not Device Related
Postoperative Mortality	1 – Not Device Related
Longest surviving Implant	14 months

The Direct Flow Medical (DFM) Aortic Valve Prosthesis



Investigational device currently in European clinical trial
Not available for sale

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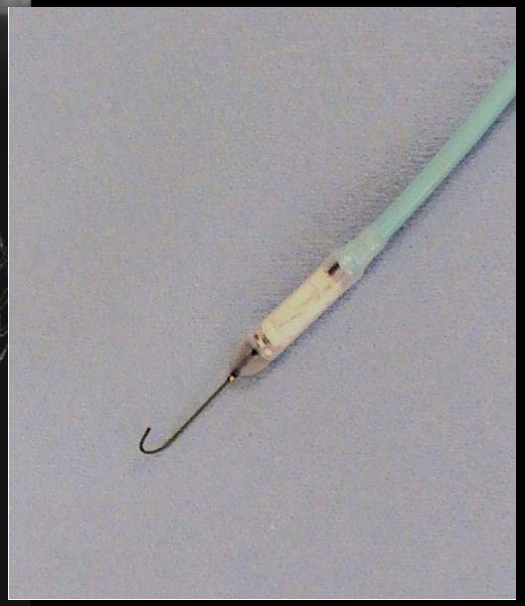
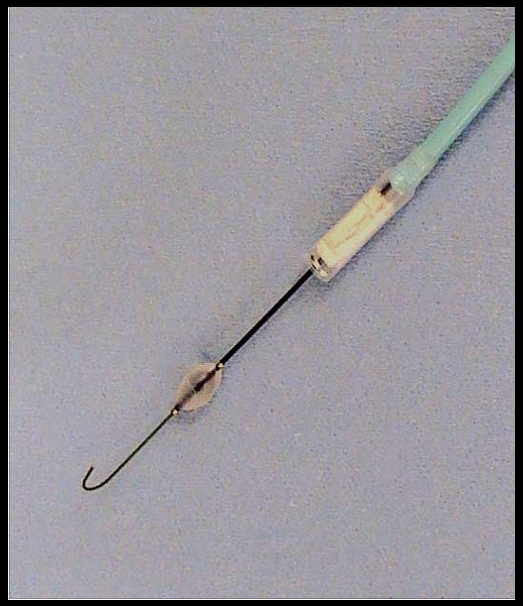
Direct Flow Aortic Valve



Valve loaded in Delivery Catheter (22F)



Introducing Tip advanced

Delivery sheath pulled back; Valve inflated

18F System Features

3 sizes matching valvuloplasty balloons

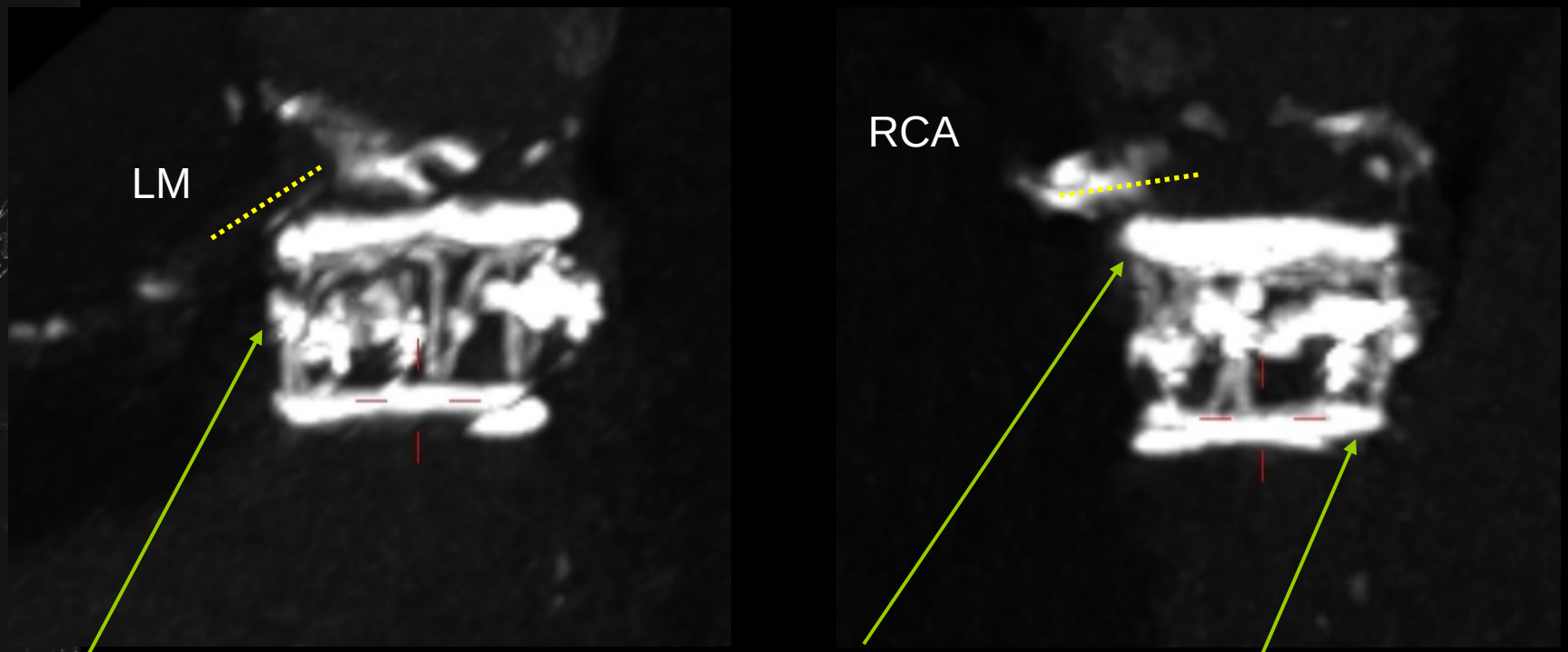
22F Design

18F Design

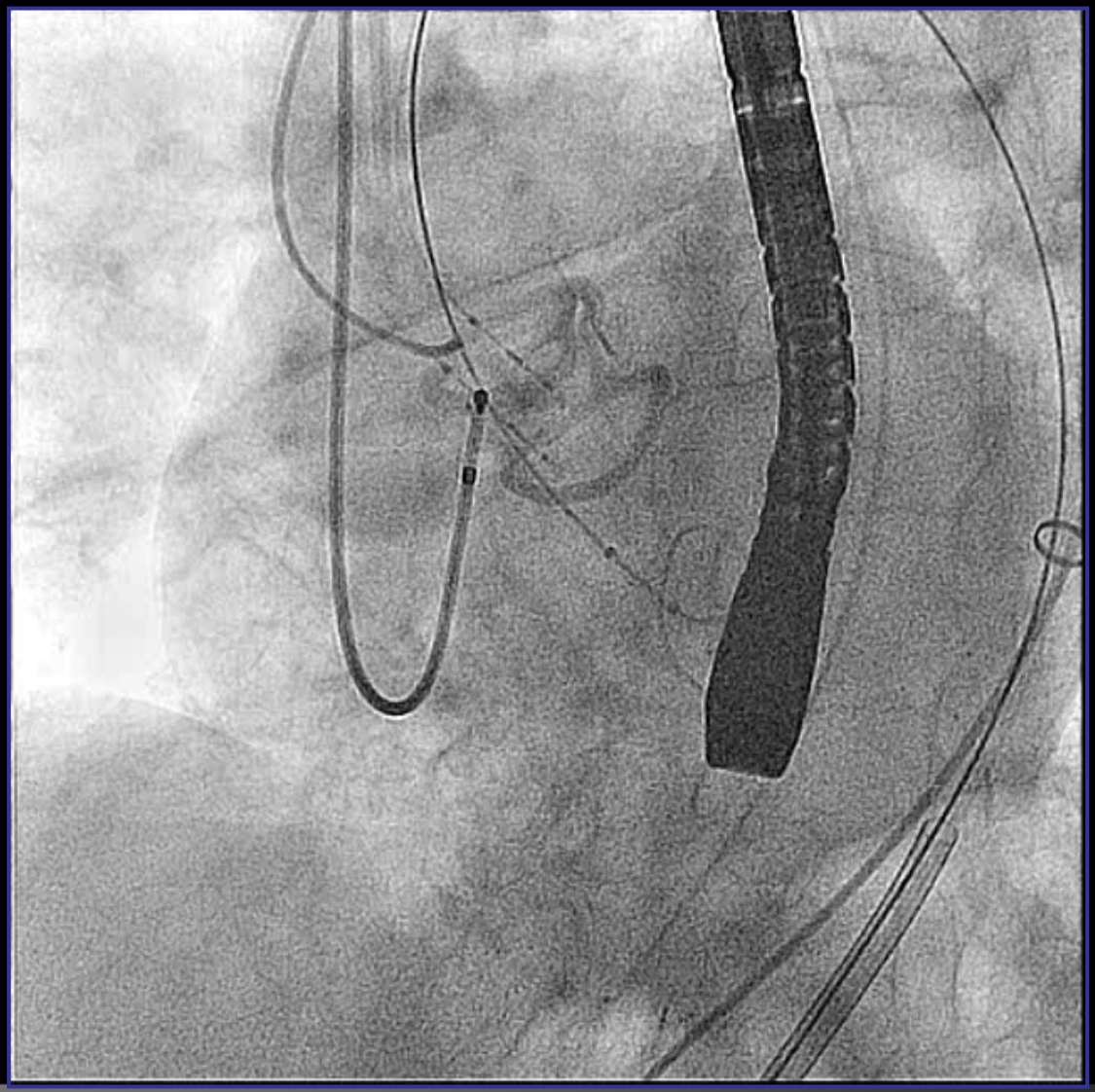
Direct Flow Medical Aortic Valve

The valve is designed to seat in the intra-annular space capturing the native leaflets

The LVOT cuff is designed to seal inferior to AV in the LVOT



The DFM Aortic Valve Prosthesis



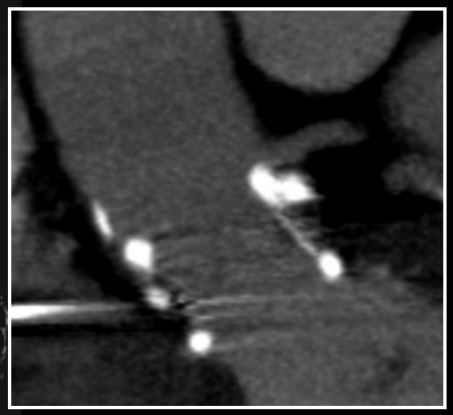
European Feasibility Trial

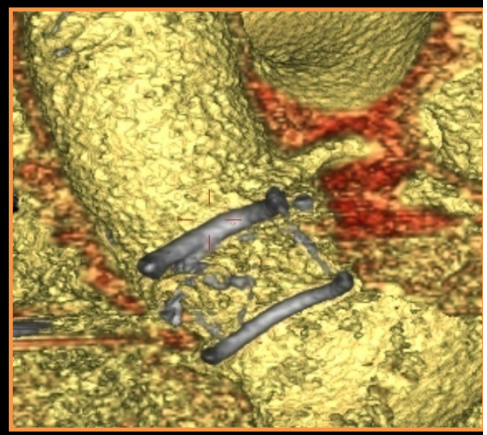
Design: Prospective, non-randomized clinical evaluation of the DFM PAV at two centers in Germany

- Hamburg University Cardiovascular Center (n=25)
- Siegburg, Helios Heart Center (n=6)

Purpose: Determine clinical feasibility and safety of treating patients at high-risk for cardiac surgery:

- EuroSCORE $\geq$ 20%
- Age $\geq$ 70
- Severe aortic valve stenosis





The DFM AV Prosthesis
European Clinical Trial

- Patients **enrolled**
  - **n** 31
  - **Age, years** **82 ± 4**
  - **Men** **15 (48%)**
  - **NYHA functional class**
    - **I** **1 (3%)**
    - **II** **8 (26%)**
    - **III** **21 (68%)**
    - **IV** **1 (3%)**
  - **LVEF, %** **53 ± 15**
  - **Logistic EuroSCORE, %** **28 ± 7**
  - **Mean pressure gradient, mmHg** **52 ± 13**
  - **Aortic valve area, cm^2** **0.6 ± 0.16**

The DFM AV Prosthesis
European Clinical Trial

Intention-to-treat population
n = 31

- → iliac access (n=2)
- → Functionally bicuspid valve (n=2)
- → Excessive LVOT calcification (n=3)
- → Annular Ø ↑↑, excessive calcification (n=1)
- → Excessive valvular calcification (n=1)

Device implanted
n = 22 (71%)

- → Surgical conversion (n=2) (1 sizing, 1 placement)

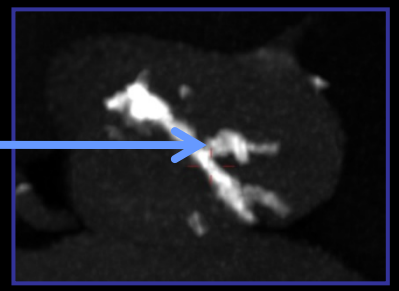
Permanent implant
n = 20 (65%)

- → Pericardial Effusion Day 2 (n=1) CoD - MI
- → CHF following procedure (n=1) CoD 2+AI low EF

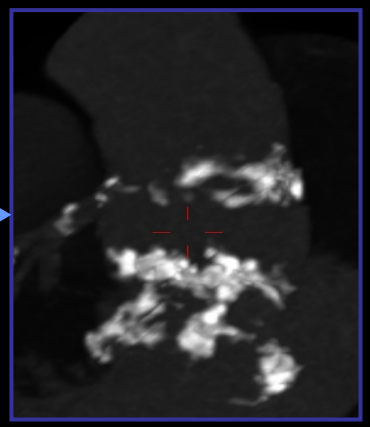
Patient's discharged
n = 18 (58%)

The DFM AV Prosthesis
European Clinical Trial

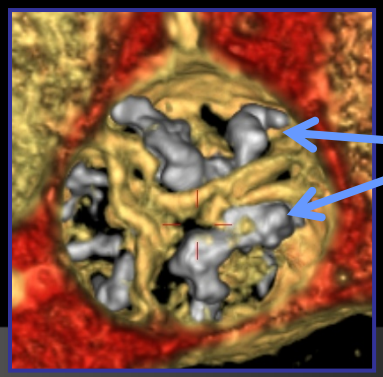
- Procedural failures secondary to native valve limitations (n=7)
  - **Functionally bicuspid native valve (n=2)**



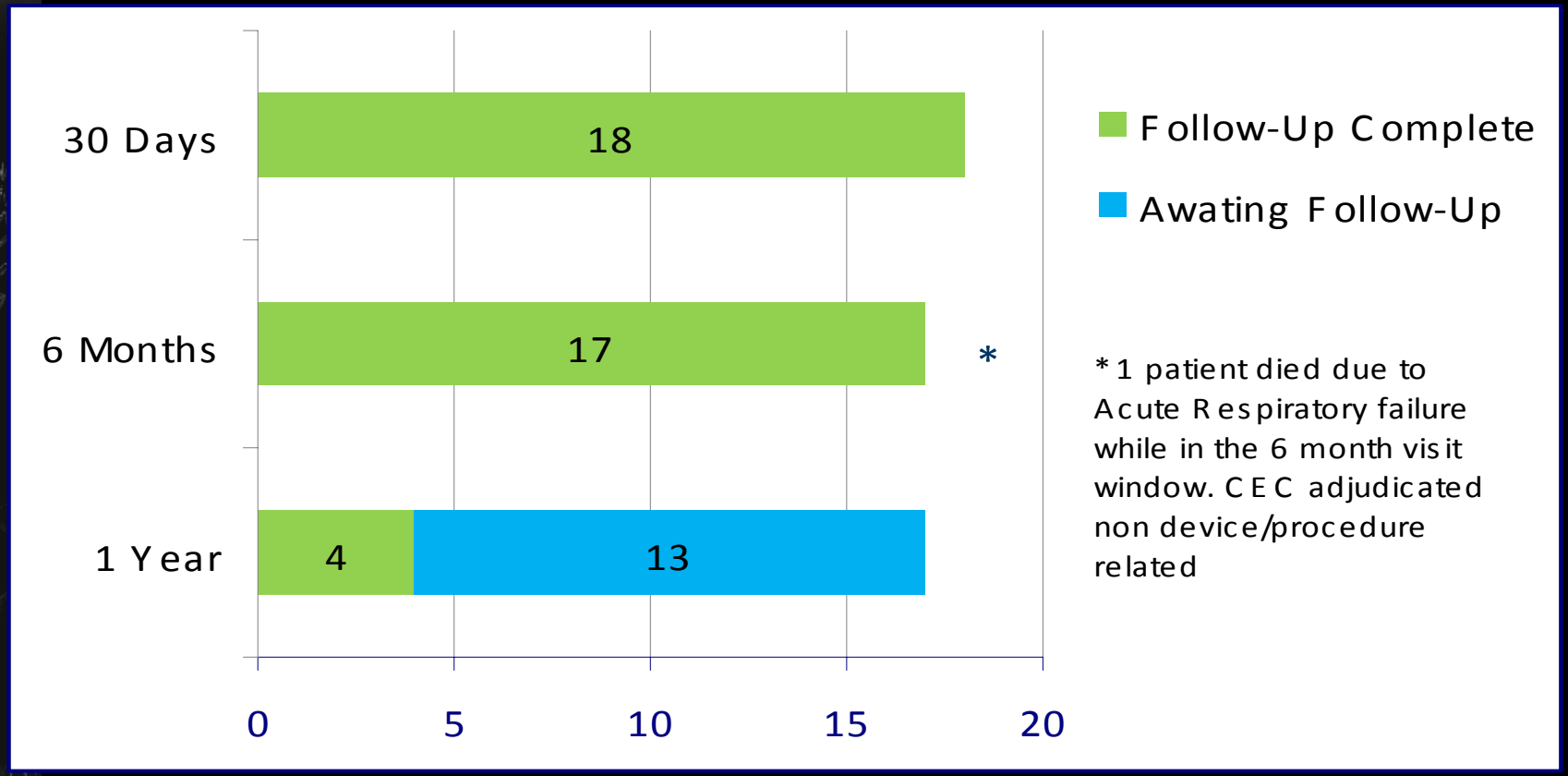
- LVOT calcification (n=3)
  - Cannot be adequately ballooned pre-implantation
  - Positioning difficulties



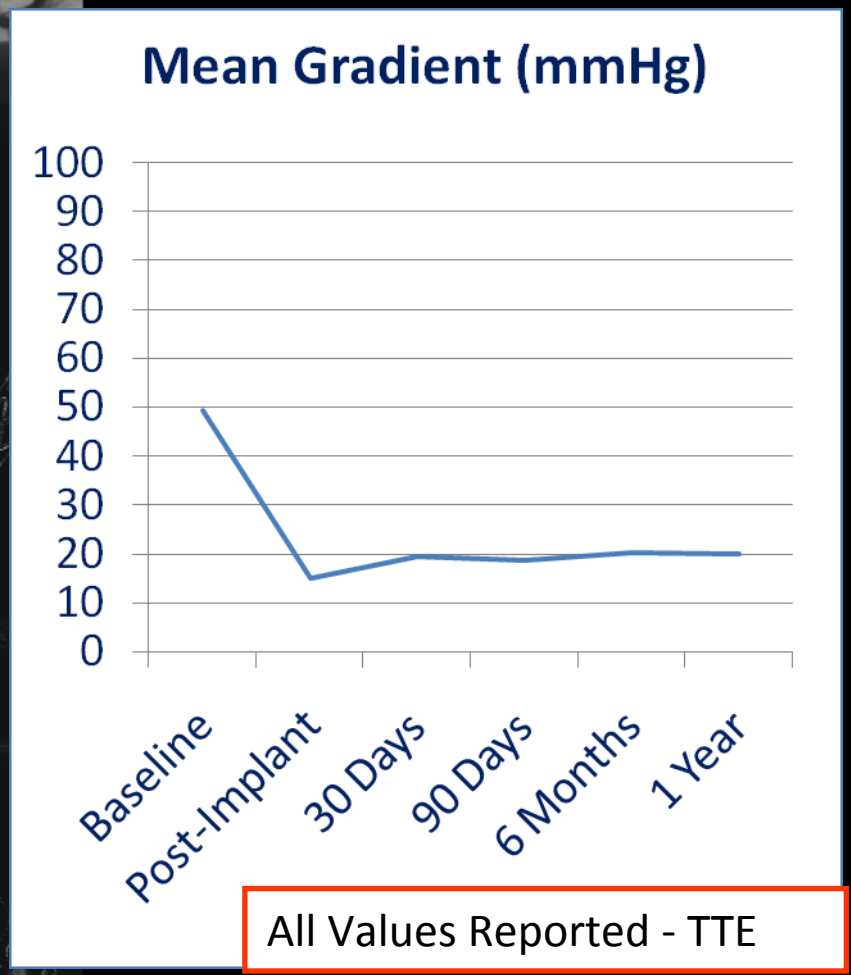
- Severe valvular calcification (n=2)
  - Does not fully open during valvuloplasty



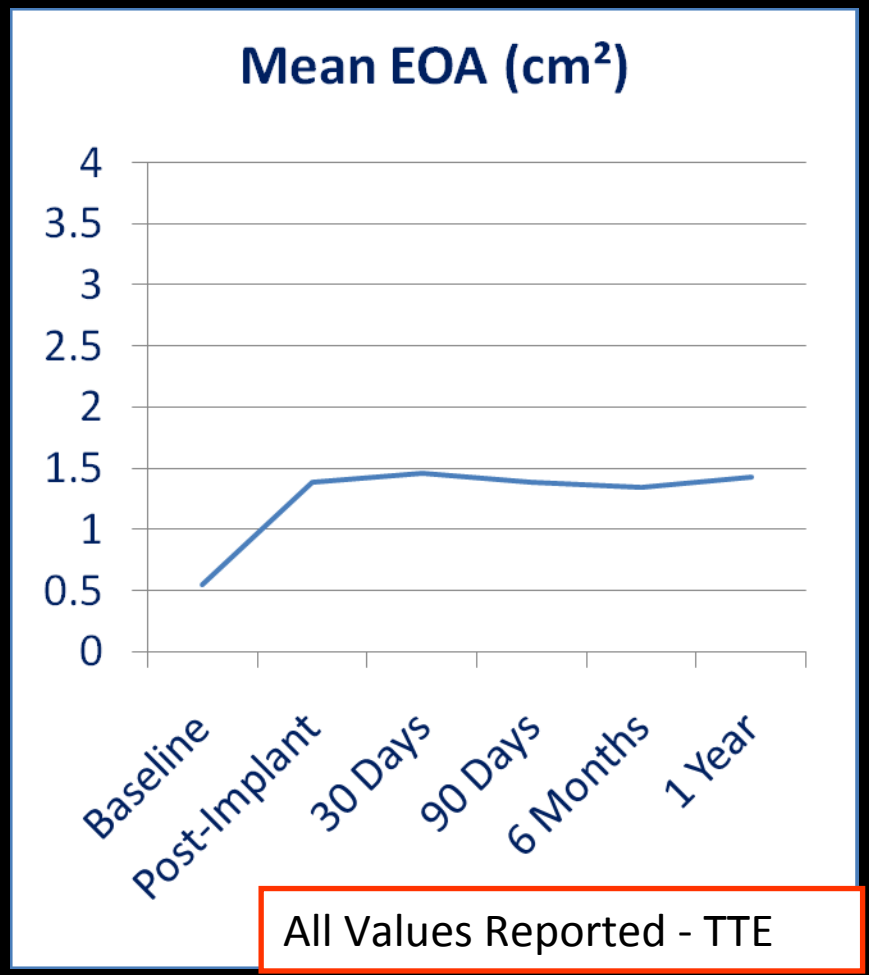
The DFM AV Prosthesis
European Clinical Trial
Discharged Patient Follow-up Status



The DFM AV Prosthesis
European Clinical Trial



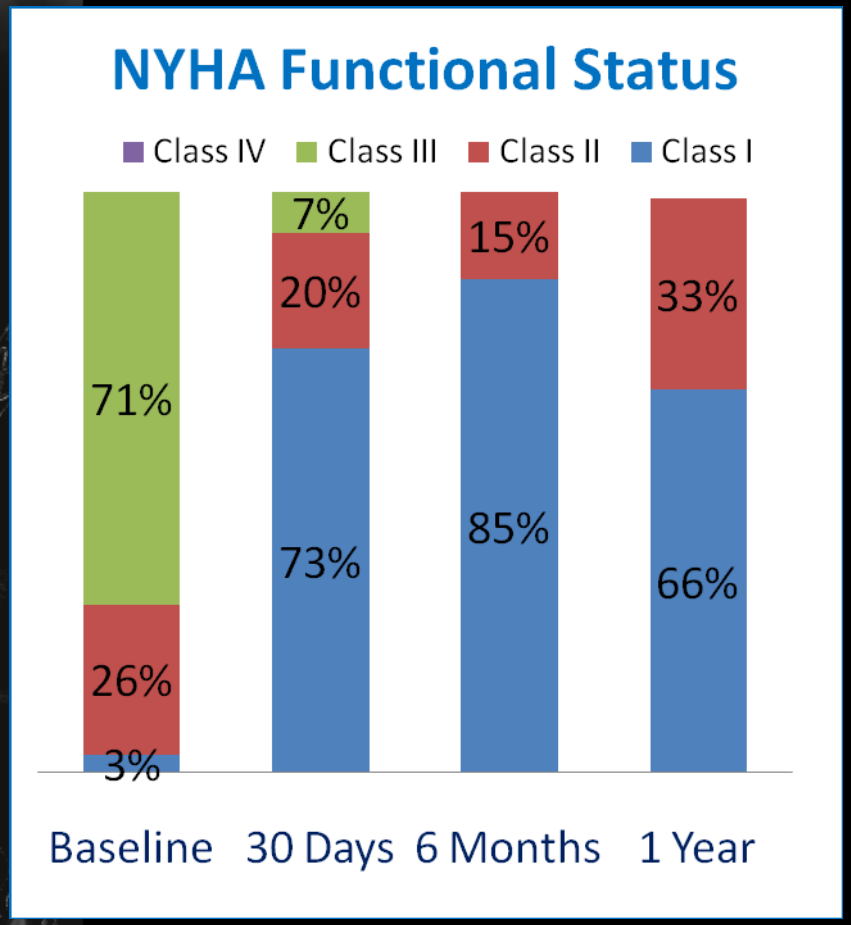
All Values Reported - TTE

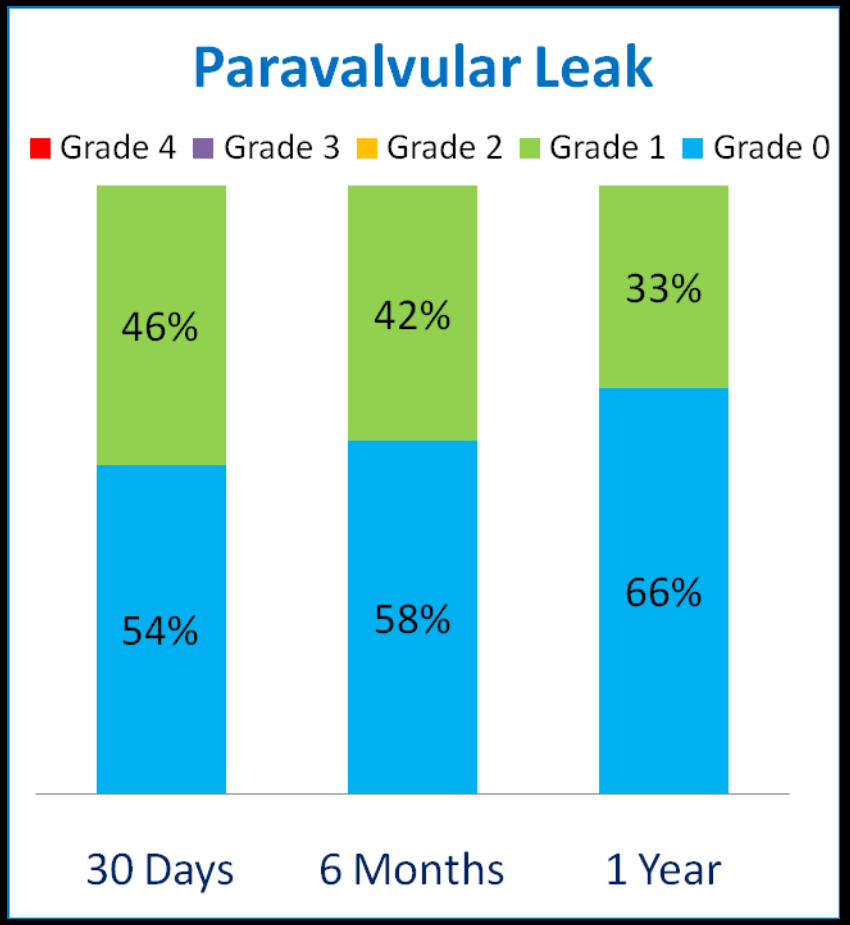


All Values Reported - TTE

The DFM AV Prosthesis
European Clinical Trial

NYHA and PV Leak





The DFM AV Prosthesis
European Clinical Trial

Adverse Event Summary

30 day Mortality — n = 4 (12.9%)

- Procedure Related (3)
  - Pulmonary Embolism
  - Pericardial Effusion, COD MI
  - Ventricular rupture – BAV related
- Device Related (1)
  - Insufficient BAV pre implant, 2^{+}AI, Low EF

Stroke — n = 1 (3.2%)

Pacemaker — n = 1 (3.2%)

Surgical conversion — n = 2 (6.5%)

- Device Sizing (1) and Placement (1)

Conclusions

- **Analysis complete of 31 Patients in the EU Feasibility Study**
- **Device Performance Findings:**
  - Repositionable and removable
  - Immediately competent
  - Minimizes paravalvular leakage and aortic insufficiency
  - The amount and distribution of leaflet and LVOT calcification impacts procedural outcome
- **Features of the next generation device (18F):**
  - Improved positioning
  - Better sizing
  - Enhanced delivery and deployment

Percutaneous Aortic Valve Prosthesis

2005: Pioneer work - adventitious

2009: Routine for experien hands and selected sites - feasible, safe

2014: Routine for all interventional sites – feasible, safe, gold-standard?

Thank you

Transcatheter AVR