



Centre for
Heart Valve Innovation
St. Paul's Hospital, Vancouver



Mitral Toolbox: Leaflets, Annulus, Chords, Stents and More

John G Webb MD
St. Paul's and Vancouver General Hospitals
University of British Columbia
Vancouver

Consultant

- Edwards Lifesciences
- Abbott
- Gore
- Medtronic
- Mitralign
- Orford
- St Jude Medical
- Transverse Medical
- Siemens
- Valtech
- Vivitro

The mitral valve is complex



Seen from LA



Seen from LV

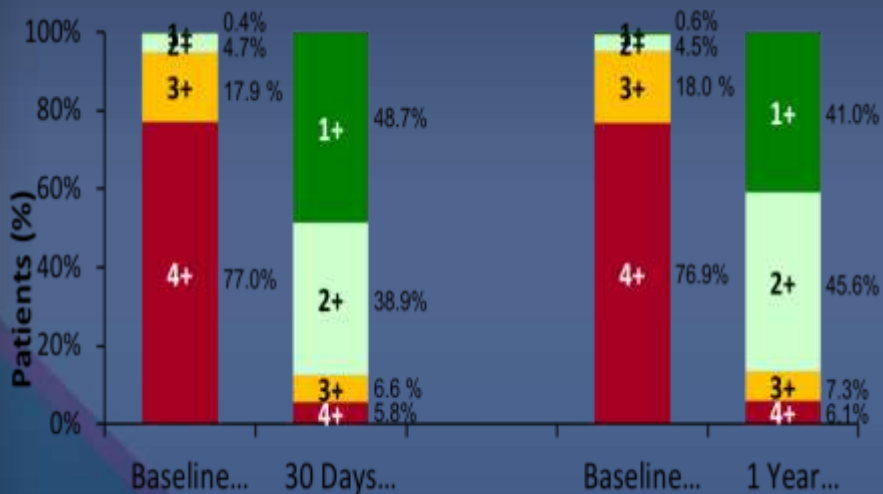
Leaflet repair

Mitraclip

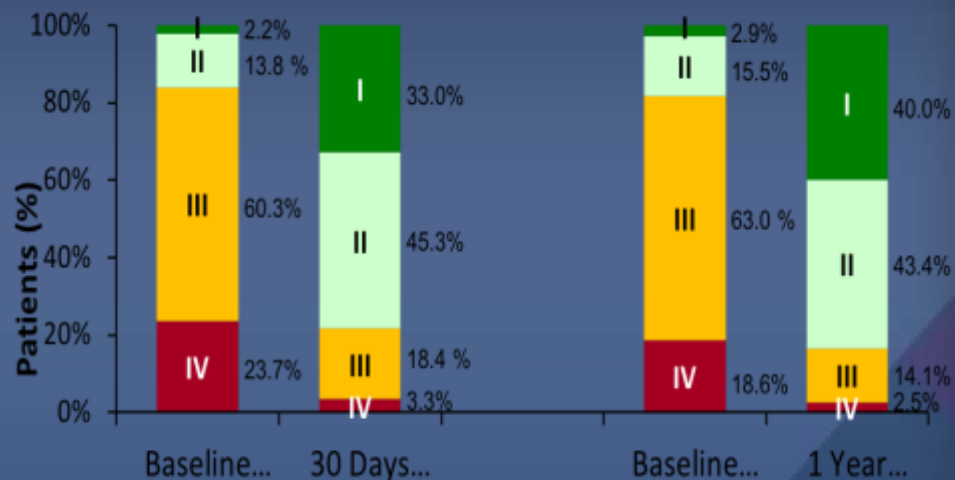


Mitraclip US Post-Approval Study Registry: 1-year Results of the First 2,000 Patients

MR improves



Functional class improves

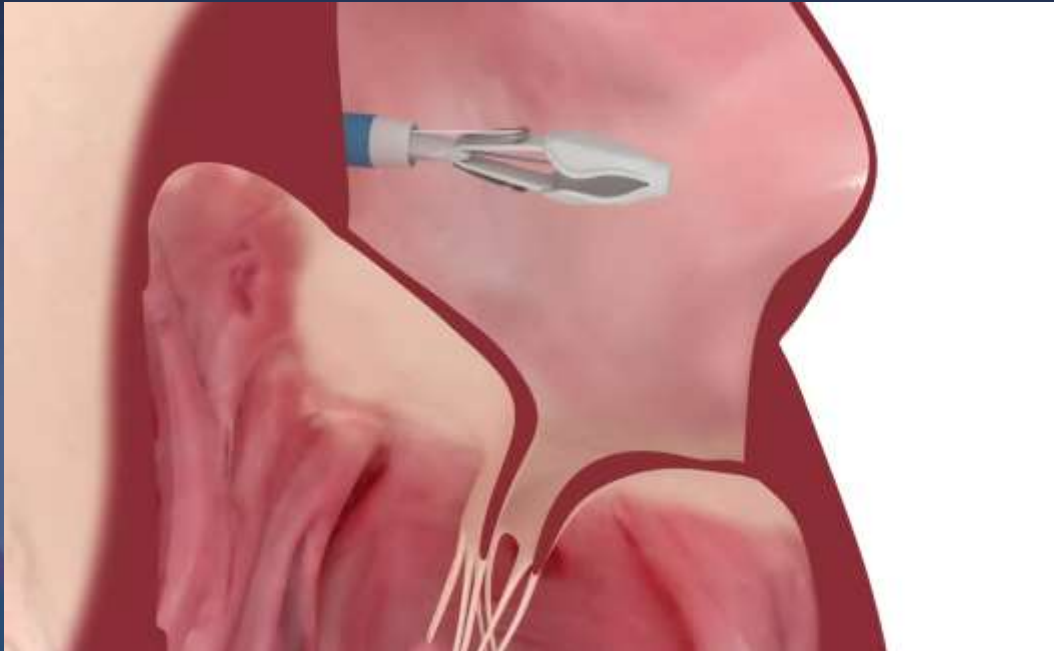


Edwards PASCAL Spacer Mitral Repair System

- Independent leaflet claspings
- Spacer between the leaflets
- Transseptal 'Commander-like' system



Edwards PASCAL Spacer Mitral Repair System



- **Independent leaflet clasp**
- **Spacer between the leaflets**
- **Transseptal**
- **‘Commander-like’**

Edwards Pascal



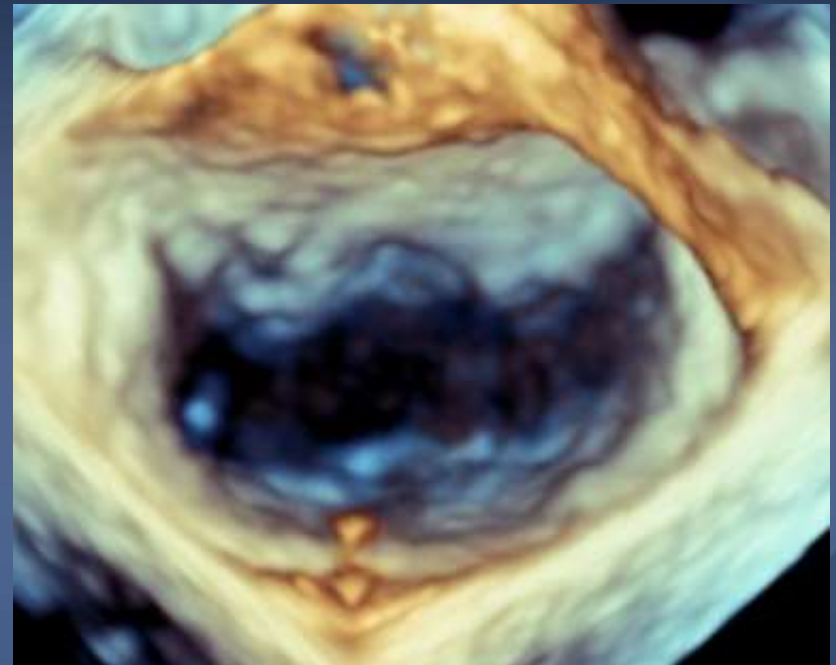
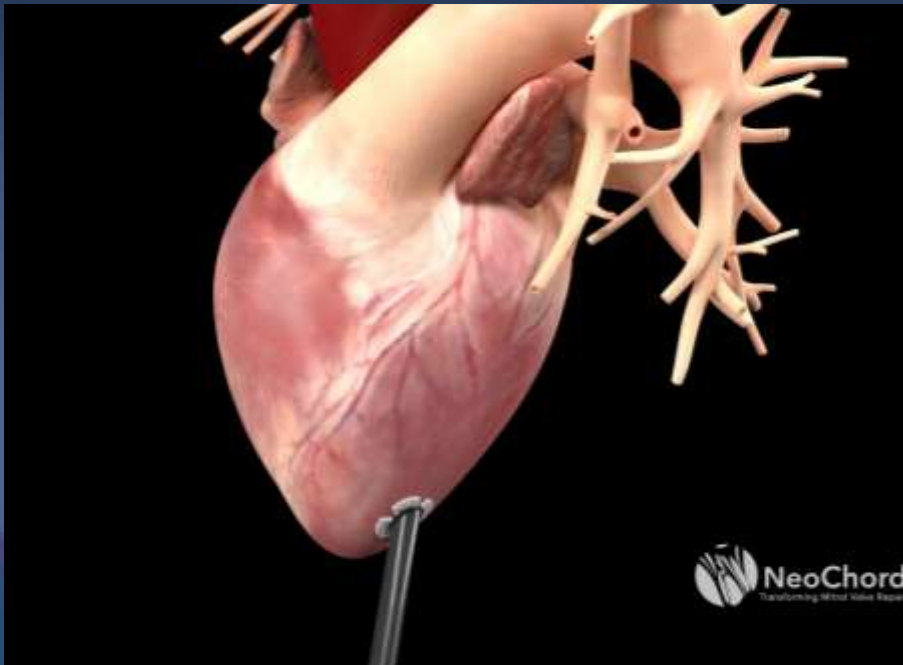
Edwards PASCAL

Optional independent grasping

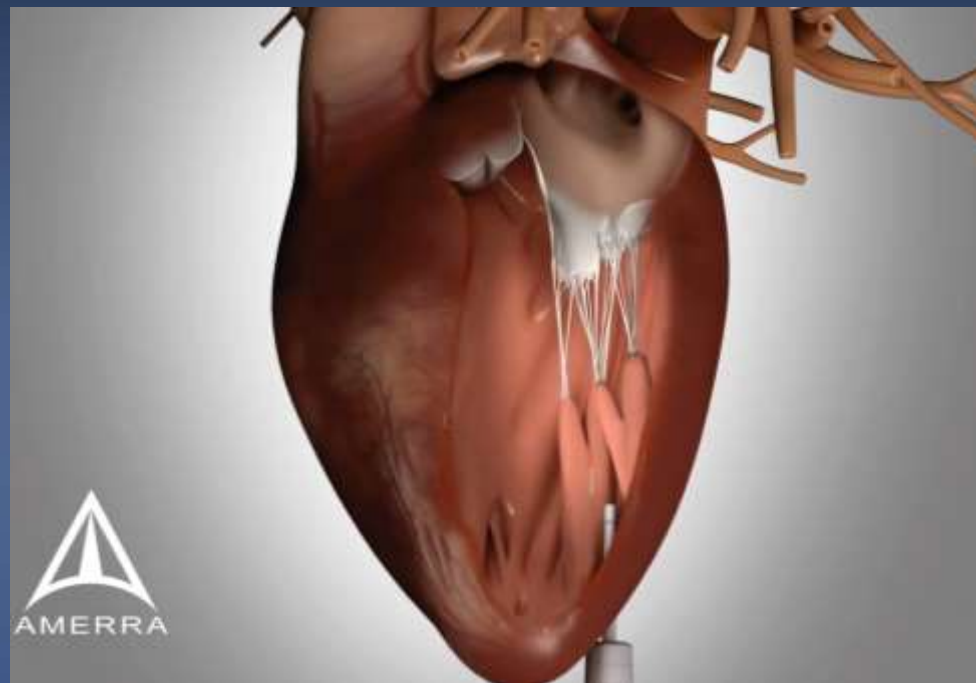
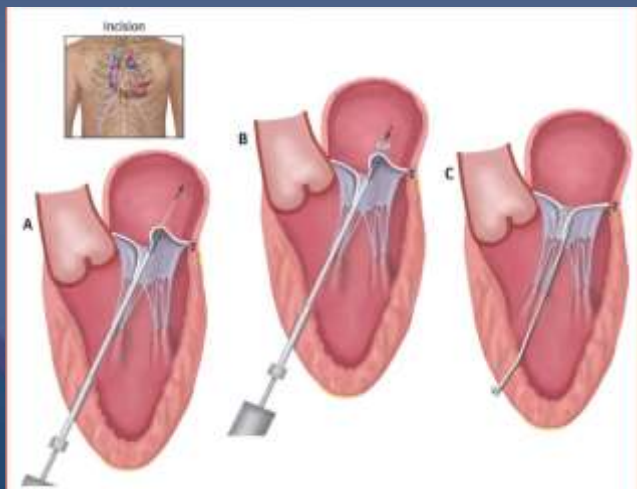


Chordal repair

Neochord chordal replacement

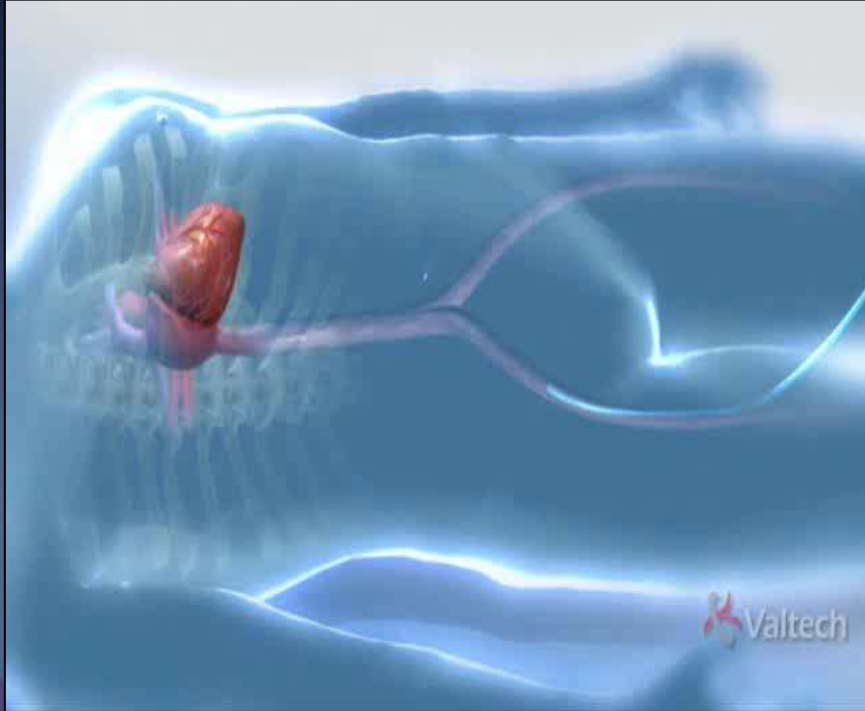


Harpoon chordal replacement

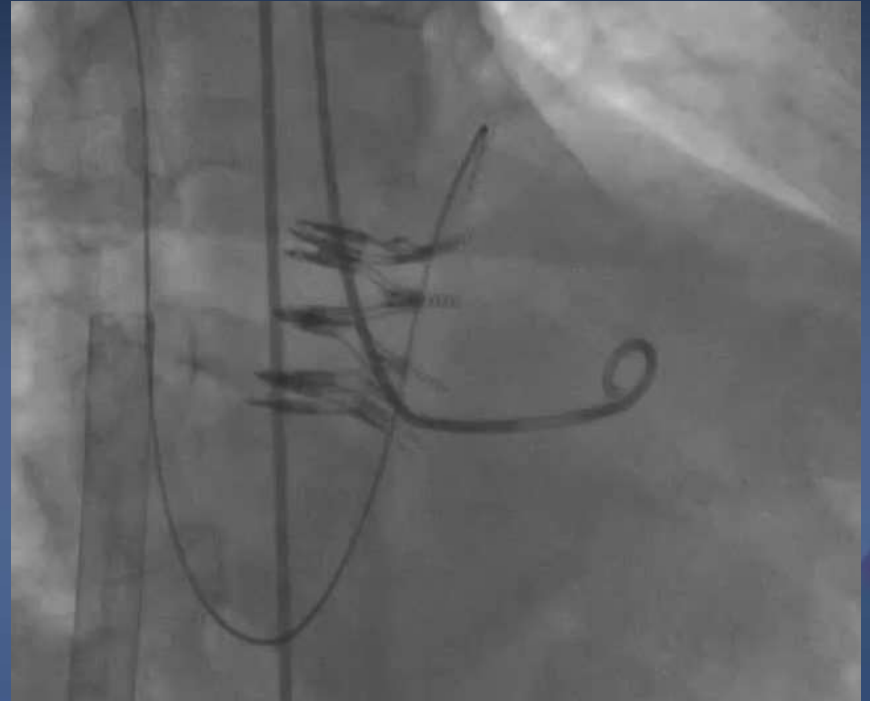
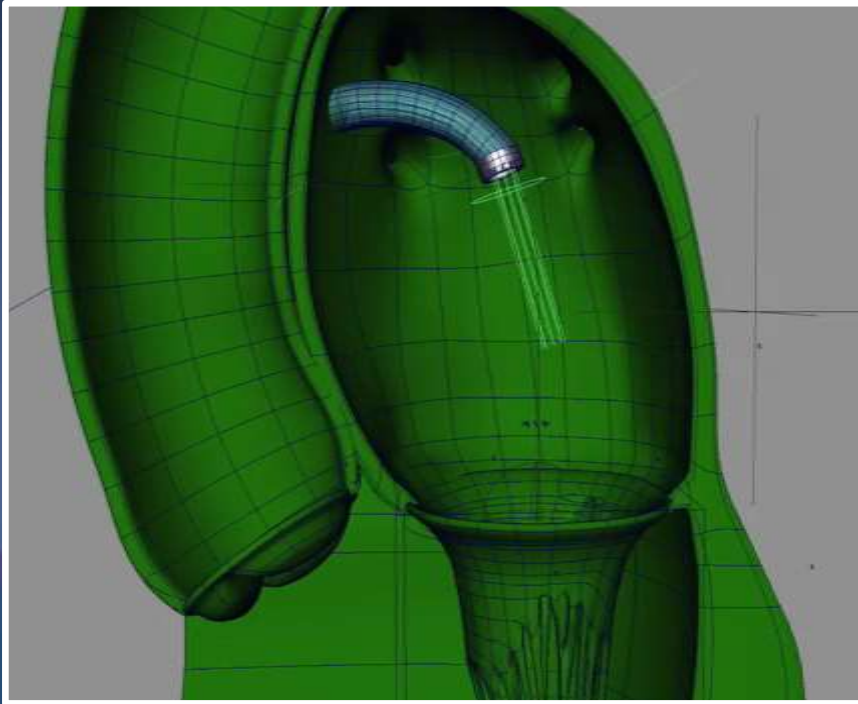


Annular repair

Edwards Cardioband



Millipede IRIS System



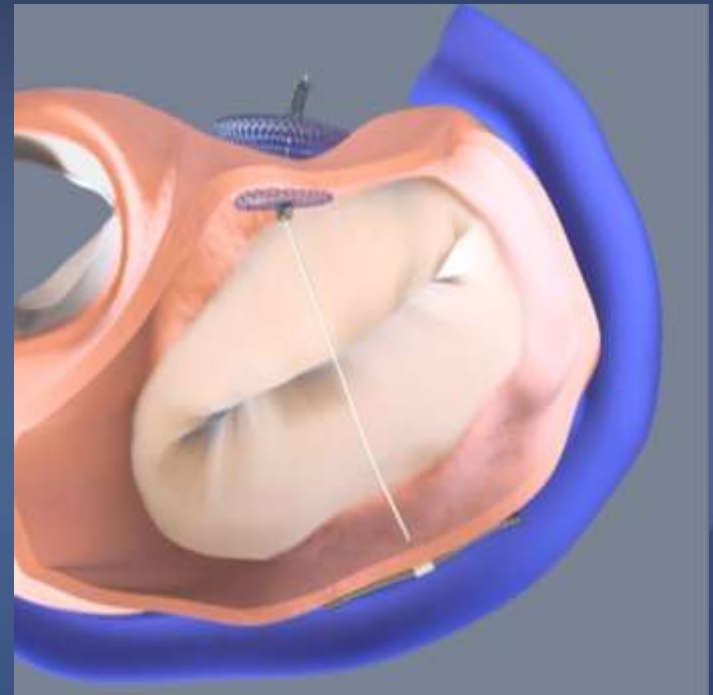
LV Remodeling

Annular reduction

Carrillon

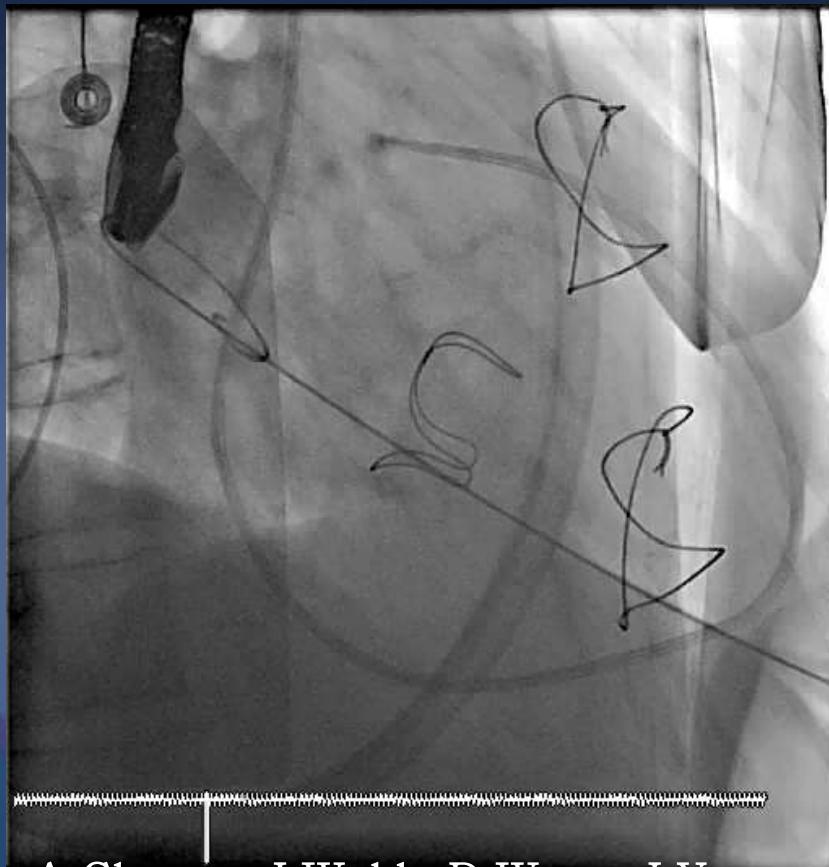


Arto



Transcatheter valve replacement

First-in-human successful MVIV 2008 ...



A Cheung, J Webb, D Wong, J Ye
Annals of Thoracic Surgery
(2009)

Journal of the American College of Cardiology
© 2013 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 61, No. 17, 2013
ISSN 0735-1097/\$36.00
<http://dx.doi.org/10.1016/j.jacc.2013.01.058>

CLINICAL RESEARCH

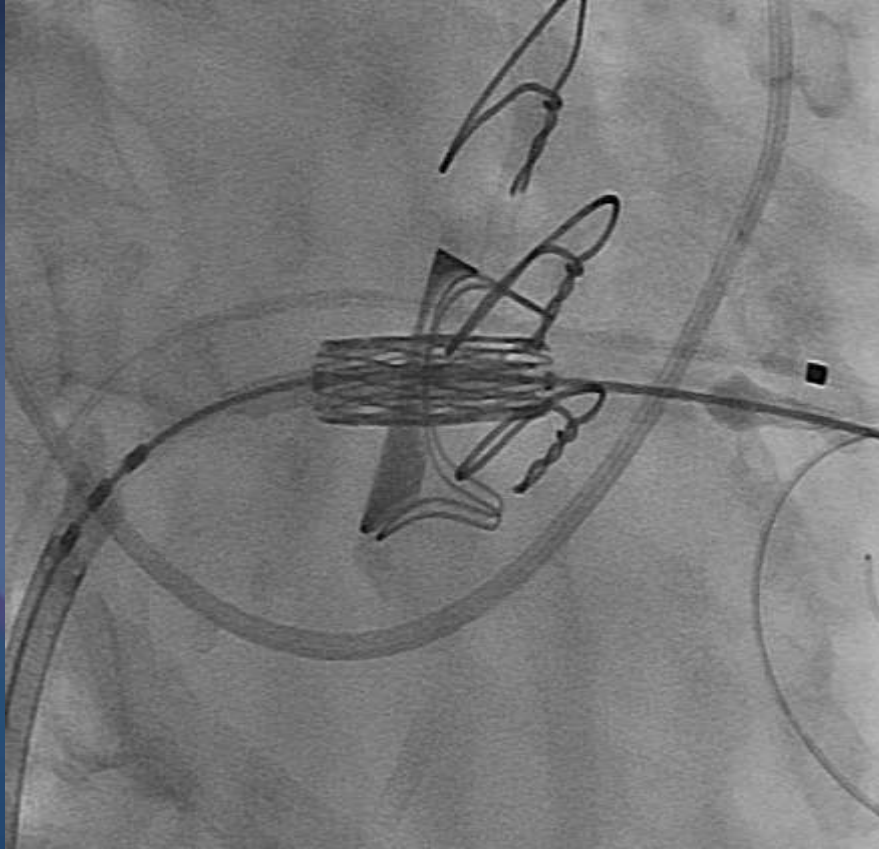
Interventional Cardiology

5-Year Experience With Transcatheter Transapical Mitral Valve-in-Valve Implantation for Bioprosthetic Valve Dysfunction

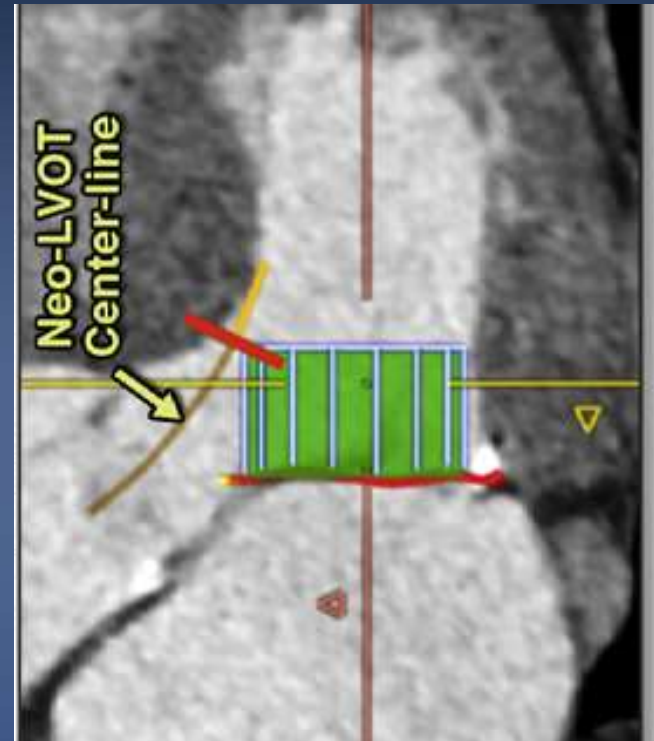
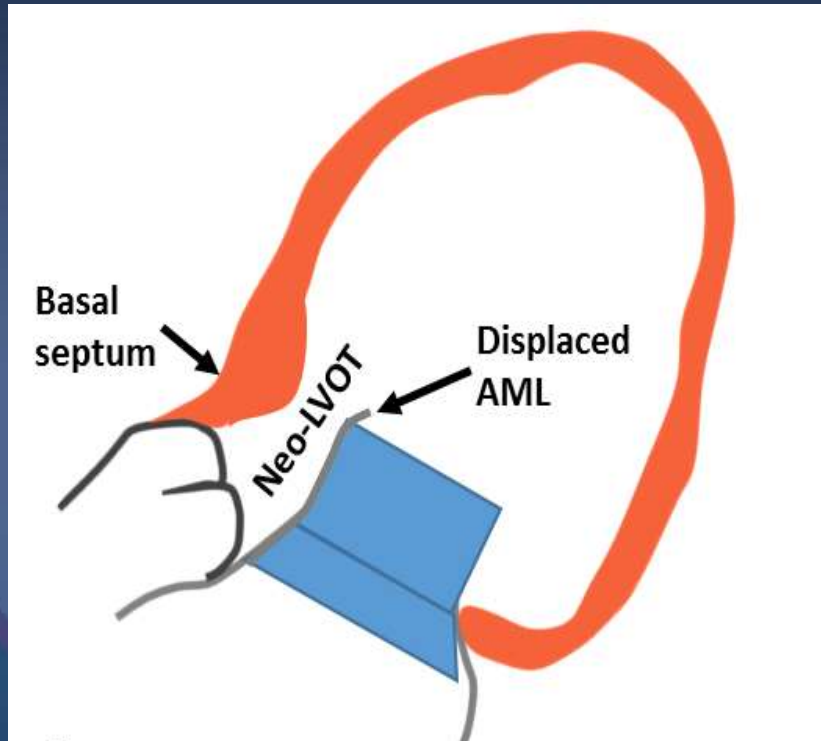
Anson Cheung, MD, John G. Webb, MD, Marco Barbanti, MD, Melanie Freeman, MD,
Ronald K. Binder, MD, Christopher Thompson, MD, David A. Wood, MD, Jian Ye, MD
Vancouver, British Columbia, Canada

Objectives	The study sought to describe the authors' experience with mitral transapical transcatheter valve-in-valve implantation (TVIV).
Background	Increasing numbers of mitral biological prostheses are being implanted in clinical practice. Transcatheter valve-in-valve implantation may be a lower risk alternative treatment for high-risk patients with mitral valve degeneration.
Methods	Twenty-three consecutive patients with severe mitral bioprosthetic valve dysfunction underwent transapical mitral TVIV between July 2007 and September 2012. Bioprosthetic failure was secondary to stenosis in 6 (26.1%), regurgitation in 9 (39.1%), and combined in 8 (34.8%) patients.
Results	All patients were elderly (mean age 81 ± 6 years) and at high-risk for conventional redo surgery (Society of Thoracic Surgeons score 12.1 ± 6.8). Successful transapical mitral TVIV was accomplished in all patients using balloon expandable valves (Edwards Lifesciences, Irvine, California) with no intraoperative major complications. One (4.4%) major stroke and 6 (26.1%) major bleeds were reported during hospitalization. Mitral transvalvular gradient significantly decreased from 11.1 ± 4.6 mm Hg to 6.9 ± 2.2 mm Hg following the procedure ($p < 0.01$). Intervalyular mitral regurgitation was absent (47.8%) or mild (52.2%) in all cases after mitral TVIV. No cases of transvalvular regurgitation were seen. All patients were alive on 30-day follow-up. At a median follow-up of 753 days (interquartile range: 376 to 1,119 days) survival was 90.4%. One patient underwent successful mitral TVIV reintervention at 2 months due to atrial migration of the transcatheter valve. All patients alive were in New York Heart Association functional class I/II with good prosthetic valve performance.
Conclusions	Transcatheter transapical mitral valve-in-valve implantation for dysfunctional biological mitral prosthesis can be performed with minimal operative morbidity and mortality and favorable midterm clinical and hemodynamic outcomes. (J Am Coll Cardiol 2013;61:1759-66) © 2013 by the American College of Cardiology Foundation

Transseptal mitral valve-in-valve



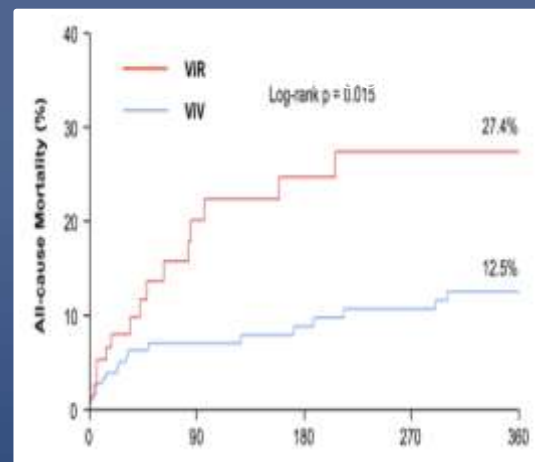
“NeoLVOT”: screening for obstruction risk



Valve-in-valve vs valve-in-ring

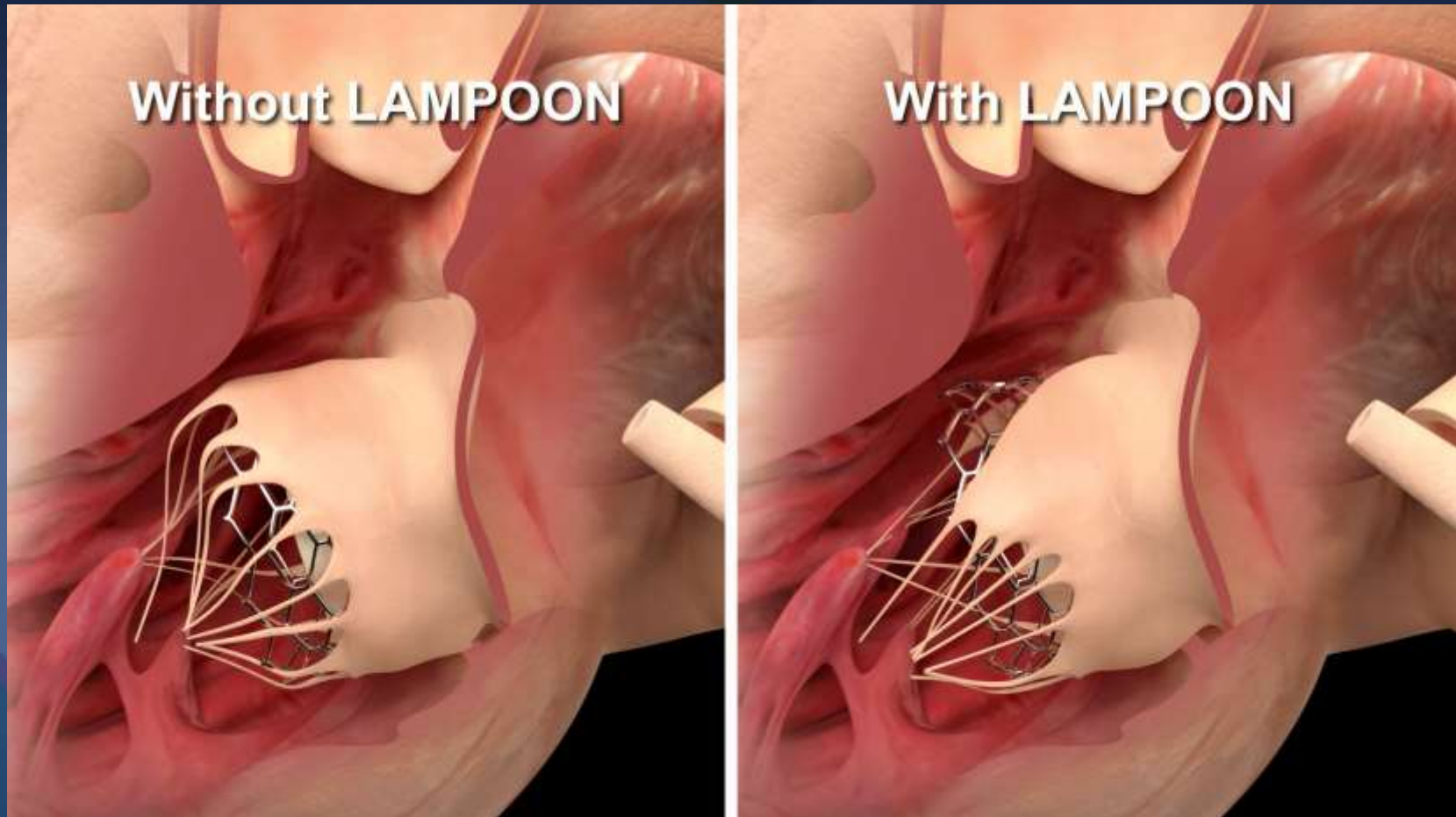


PV leak
with plug

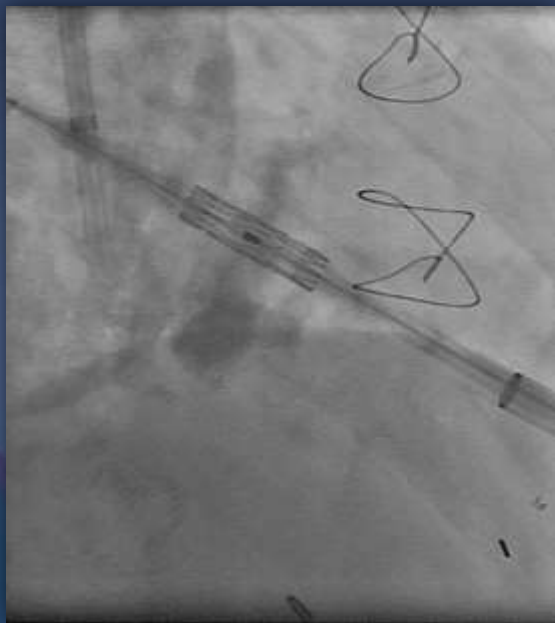


Leaks,
malposition,
LVOTO

LAMPOON: splitting the AML



Sapien in calcified mitral valves



Transapical or transseptal

Two year follow up

TMVR is evolving rapidly



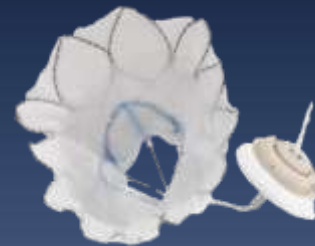
CardiAQ



Tiara



Fortis



Tendyne



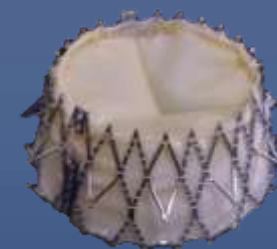
HighLife



Intrepid

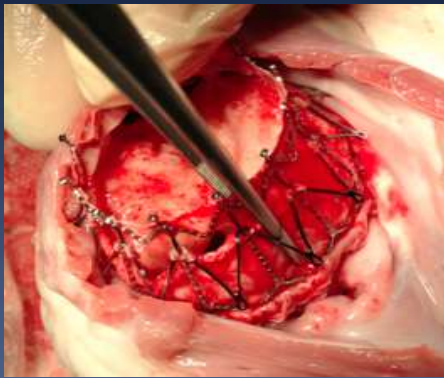


Caisson



Navigate

Outflows



CardiaQ



Fortis



Intrepid

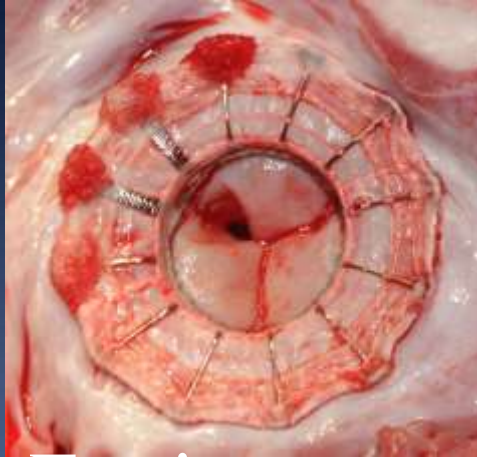


Caisson



HighLife

Inflows



Fortis



Intrepid



HighLife



Caisson

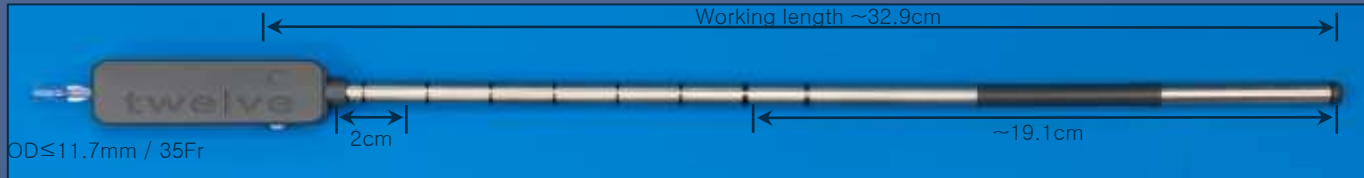
Trans-apical delivery catheters



Tendyne



Intrepid



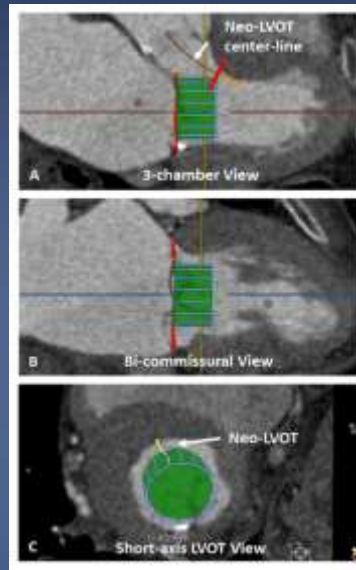
Tiara



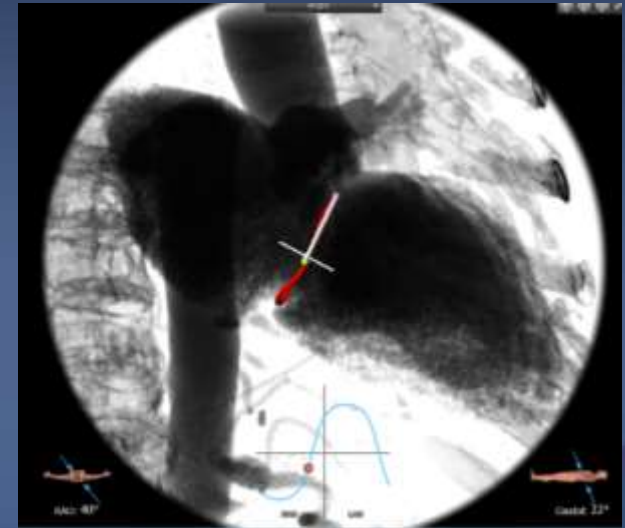
Procedure planning will become more complex



**3D
modeling**

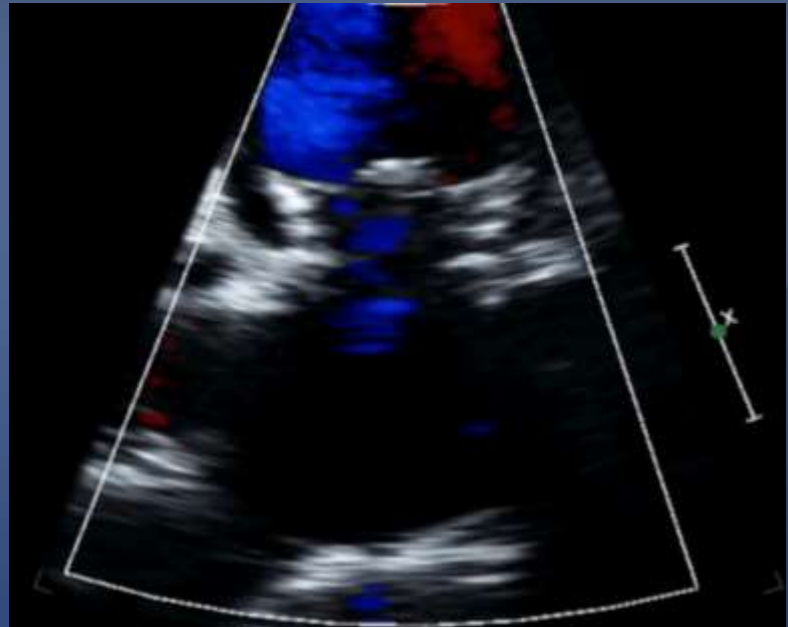
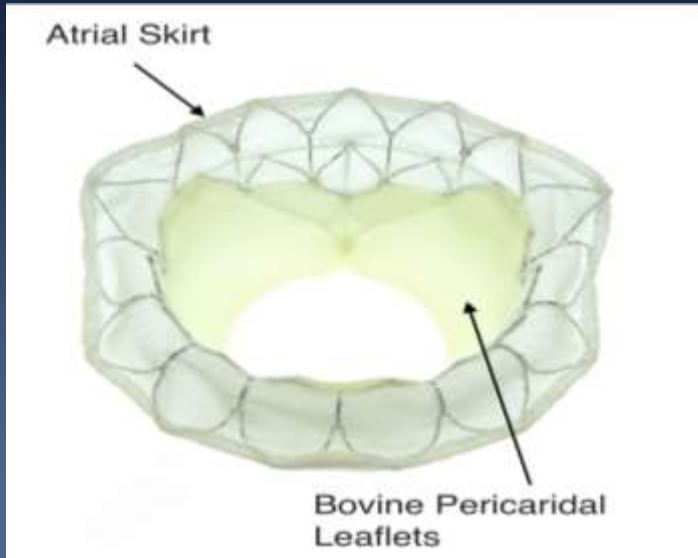


**Virtual
implants**



**Procedure
planning**

Tiara Mitral Prosthesis



No MR at 3 year follow up

CardiAQ–Edwards Transcatheter Mitral Valve Replacement System



— **Transseptal delivery system**

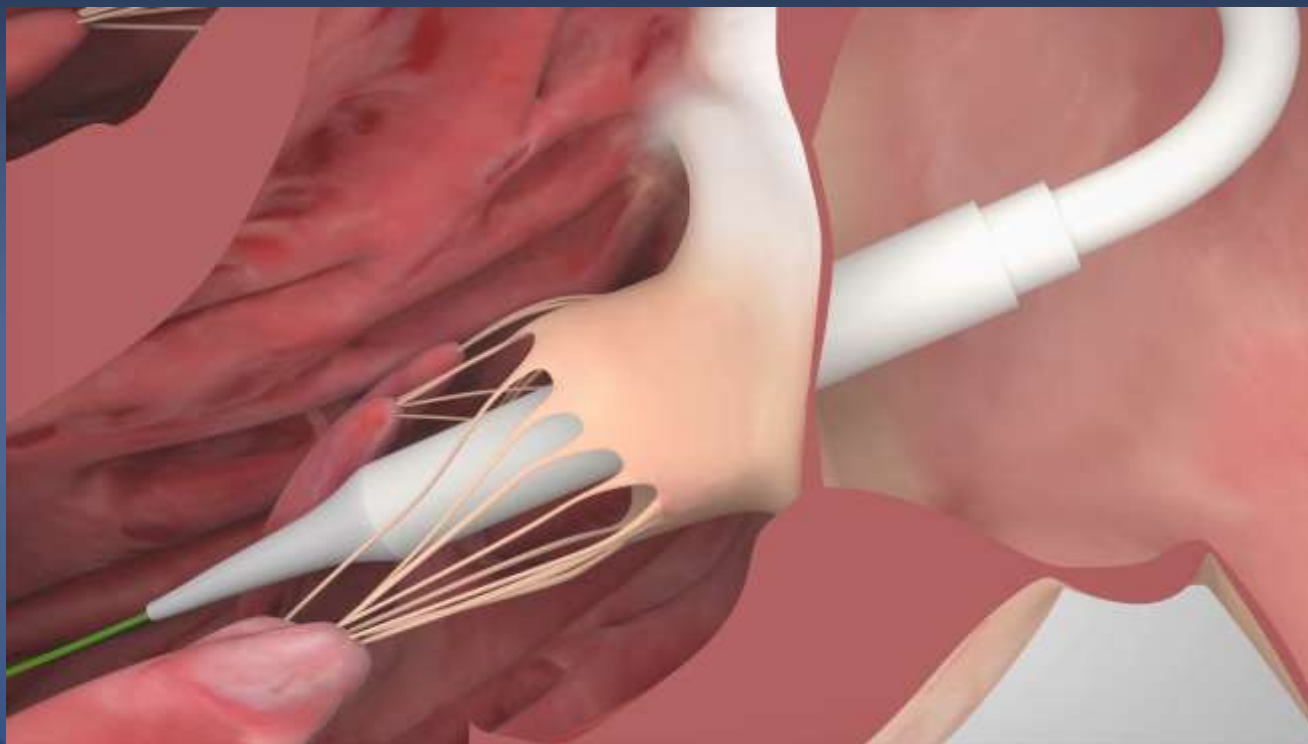
Trileaflet bovine pericardial

Nitinol frame

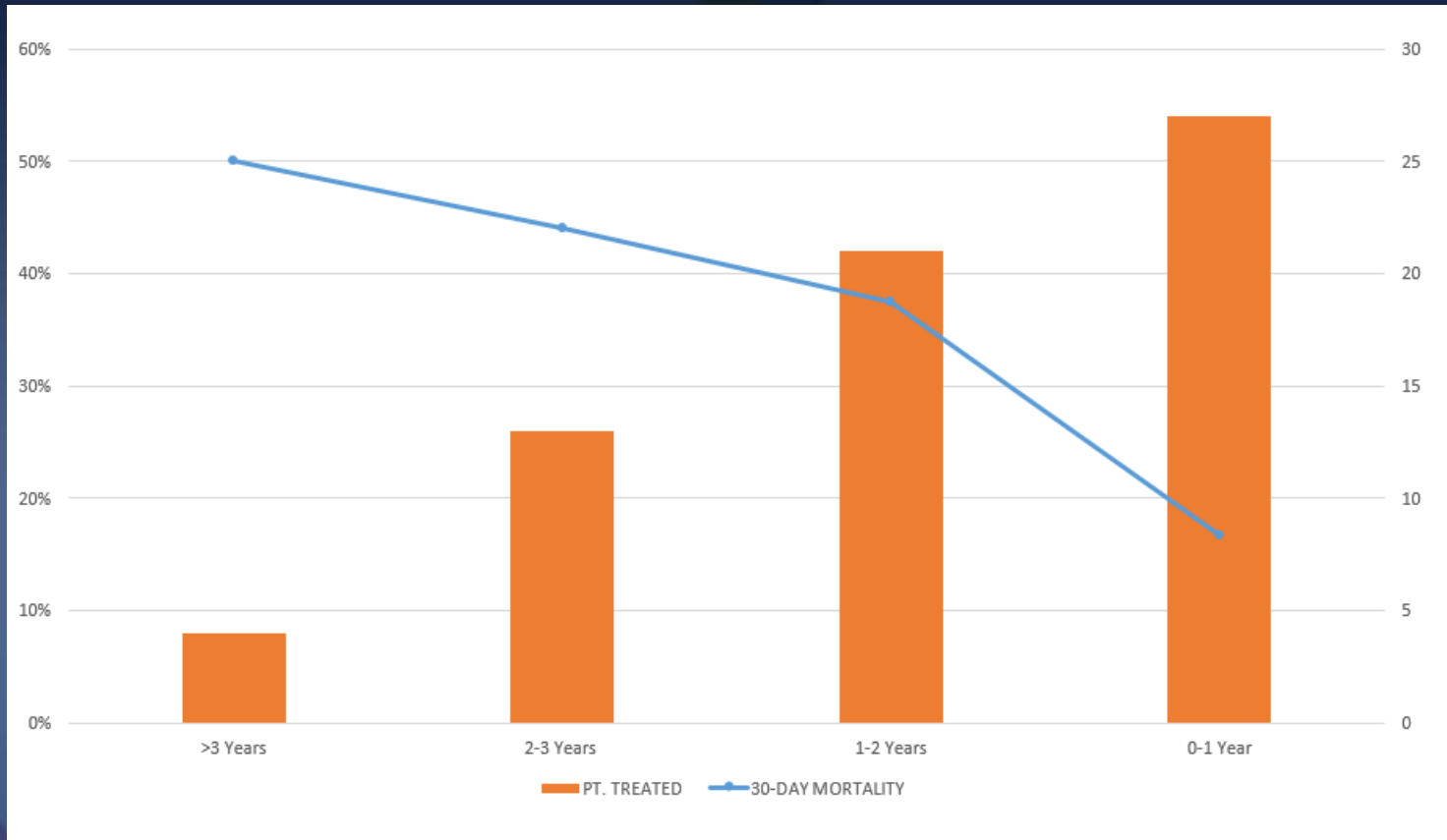
Fabric skirt



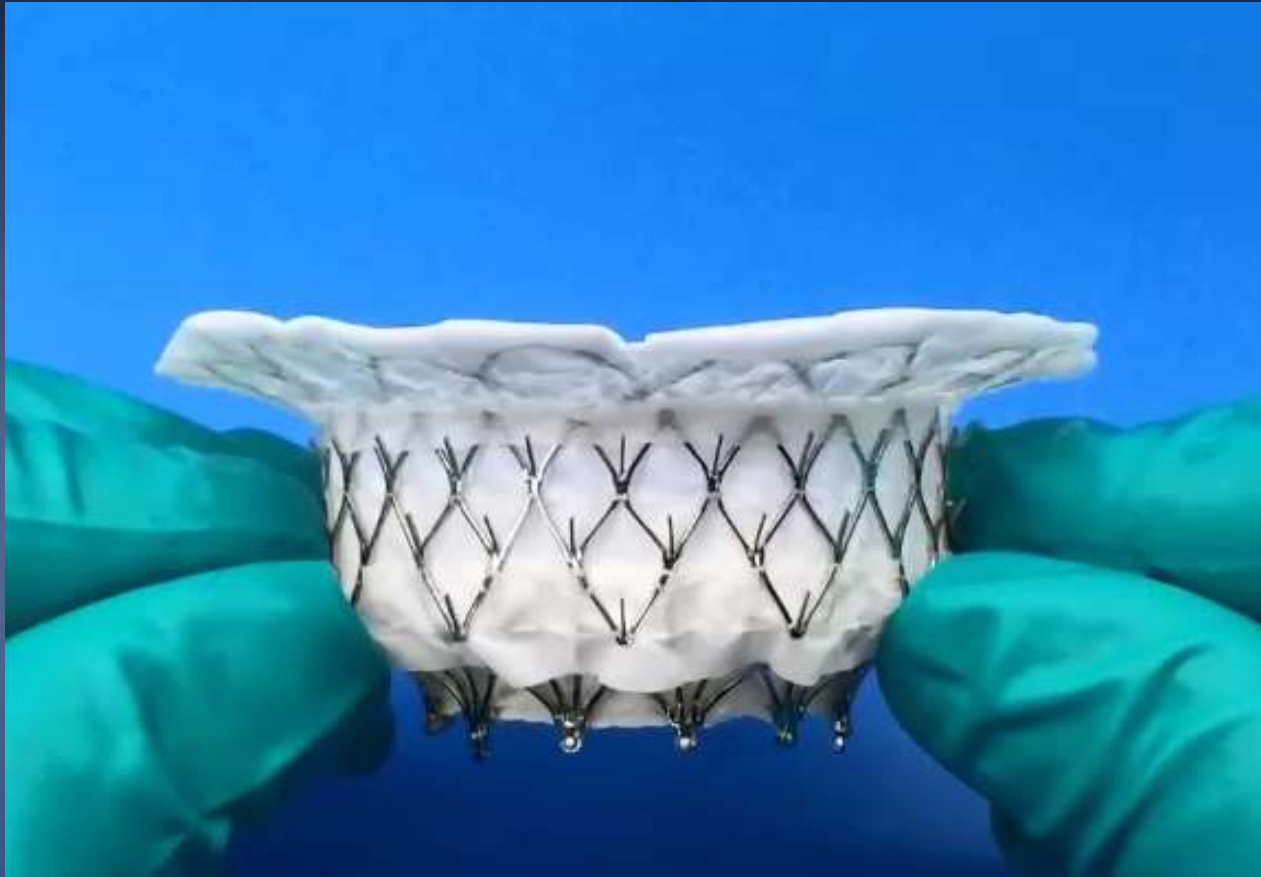
CardiAQ–Edwards Transcatheter Mitral Valve Replacement System



Positive Trend in Outcomes Attributed to Clinical Learning

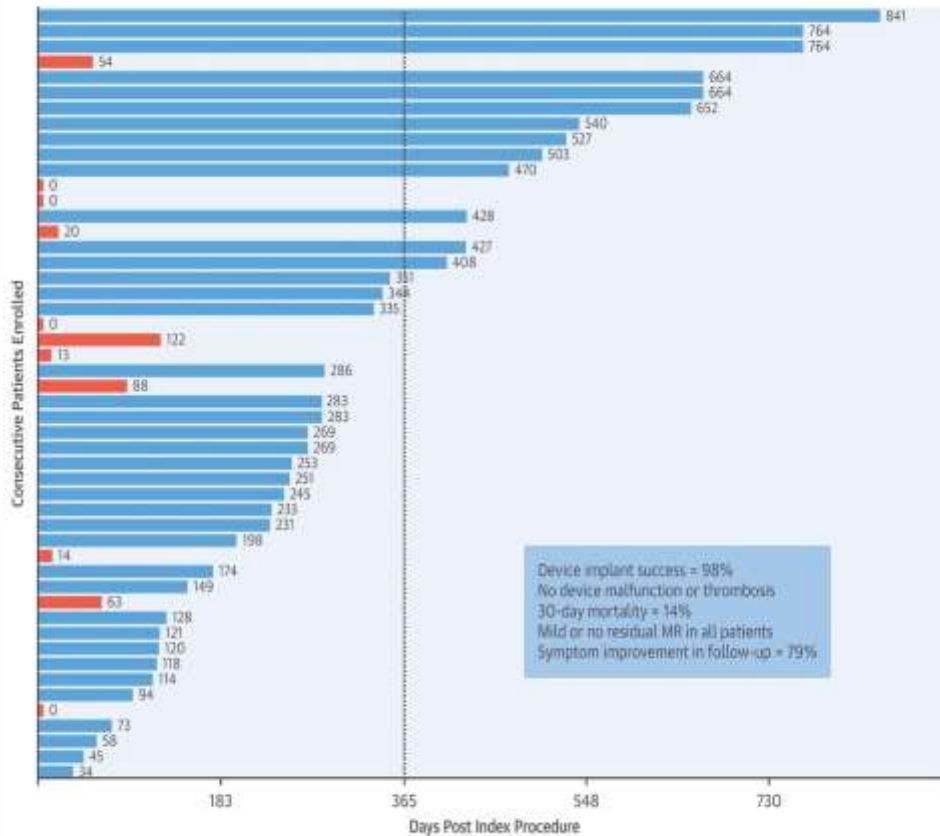


Medtronic Intrepid



Medtronic Intrepid

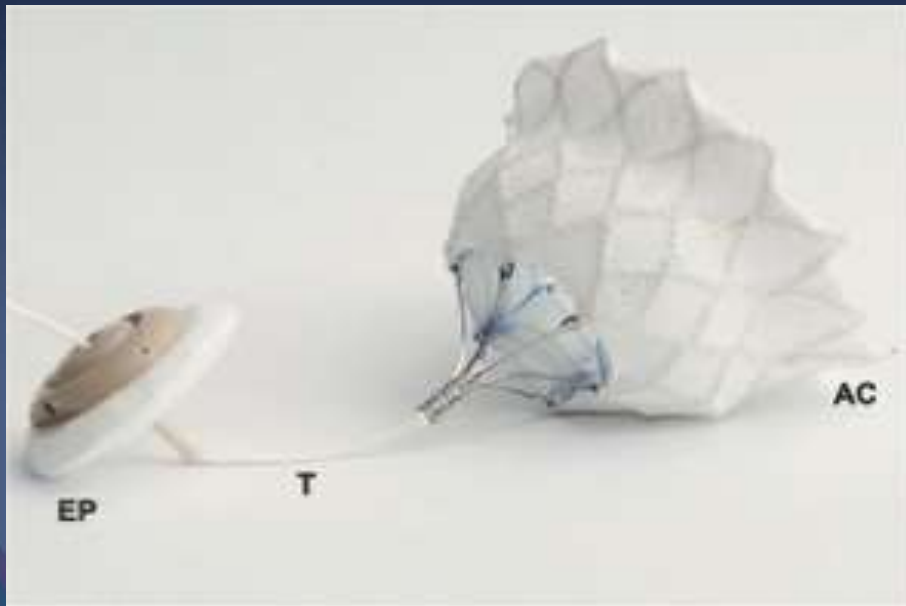
CENTRAL ILLUSTRATION: Early Clinical Experience of TMVR with the New Valve Prosthesis



Bapat, V. et al. J Am Coll Cardiol. 2018;71(1):12-21.

- Mortality 30-day 14%
- MR \leq mild 100%

Abbott Tendyne



Apical anchor, Tether, and Valve

Effective, reproducible, low risk is achievable

JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2016 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER

VOL. ■, NO. ■, 2016
ISSN 0735-1097/\$36.00
<http://dx.doi.org/10.1016/j.jacc.2016.10.068>

Transcatheter Mitral Valve Replacement for Patients With Symptomatic Mitral Regurgitation

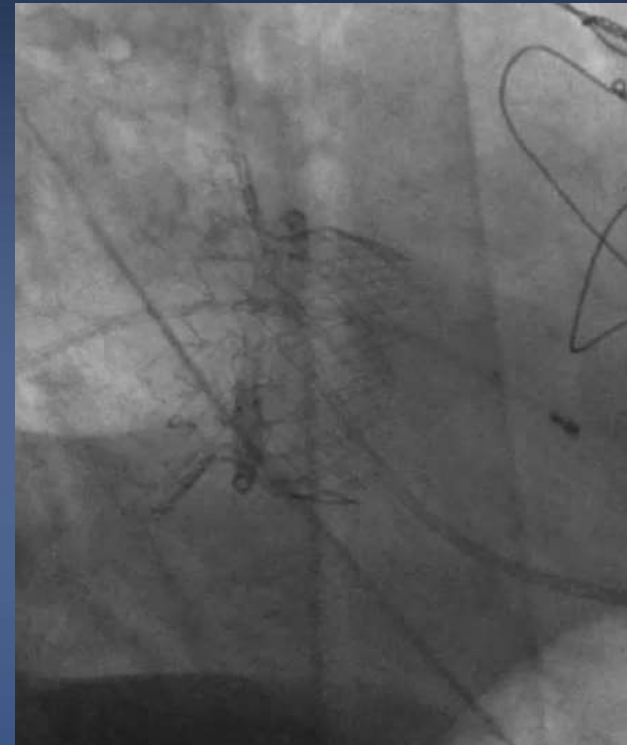
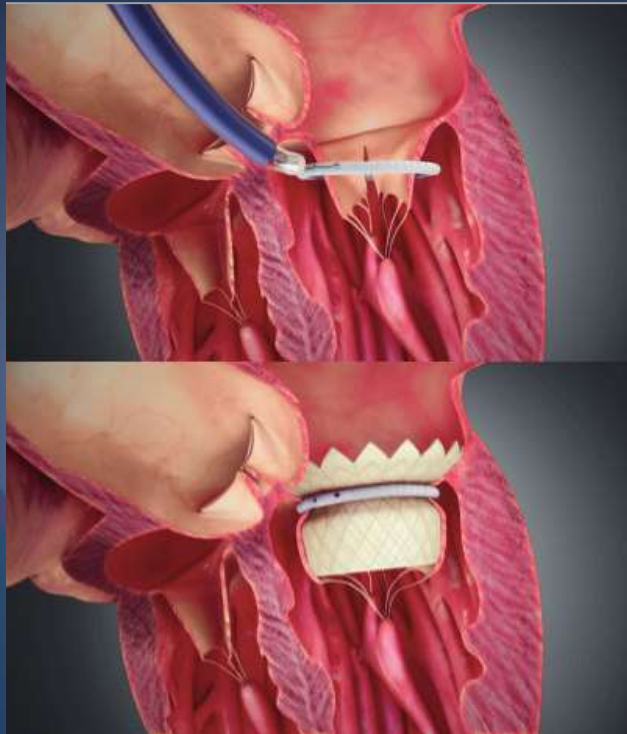
A Global Feasibility Trial

David W.M. Muller, MBBS, MD,^a Robert Saeid Farivar, MD,^b Paul Jansz, MBBS, PhD,^a Richard Bae, MD,^b Darren Walters, MBBS, MPhil,^c Andrew Clarke, MBBS,^c Paul A. Grayburn, MD,^d Robert C. Stoler, MD,^d Gry Dahle, MD,^e Kjell A. Rein, MD,^e Marty Shaw, MBBS,^a Gregory M. Scalia, MBBS,^c Mayra Guerrero, MD,^f Paul Pearson, MD,^f Samir Kapadia, MD,^g Marc Gillinov, MD,^g Augusto Pichard, MD,^h Paul Corso, MD,^h Jeffrey Popma, MD,ⁱ Michael Chuang, MD,^j Philipp Blanke, MD,^j Jonathon Leipsic, MD,^j Paul Sorajja, MD,^b
on behalf of the Tendyne Global Feasibility Trial Investigators

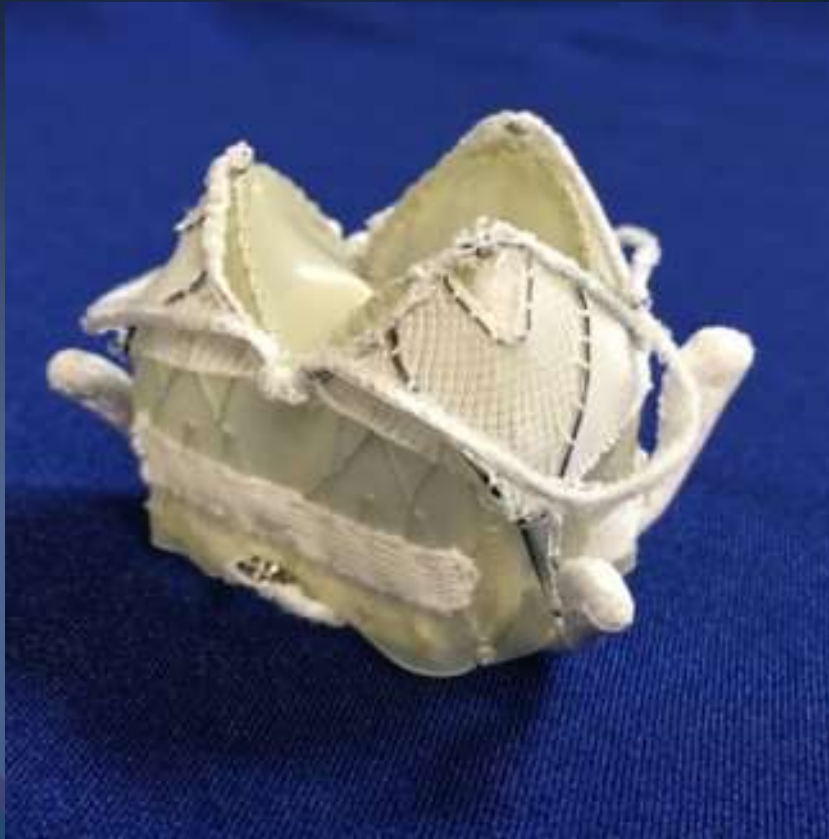
Outcome at 30 days	N=30
Death	0%
Stroke	0%
PV leak	3.3%

Muller et al. Tendyne

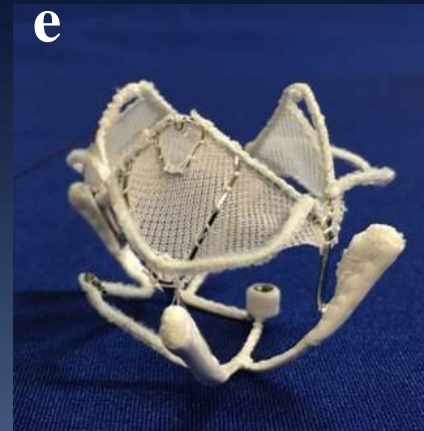
HighLife: two component system



Caisson Fram



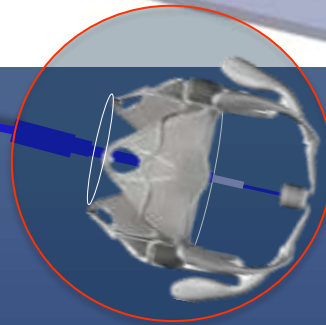
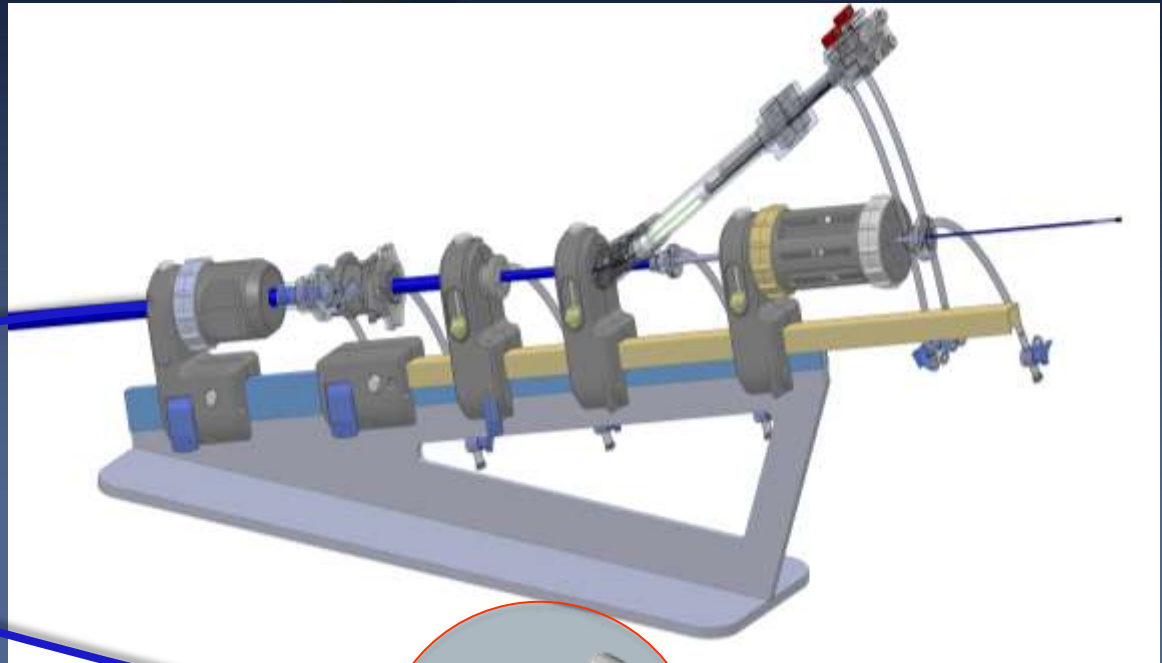
Two staged implant



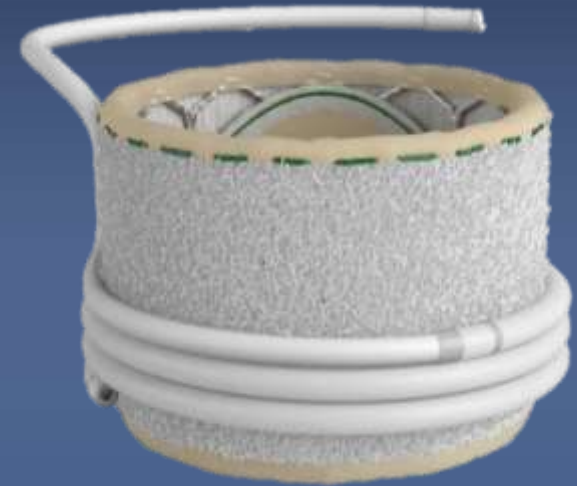
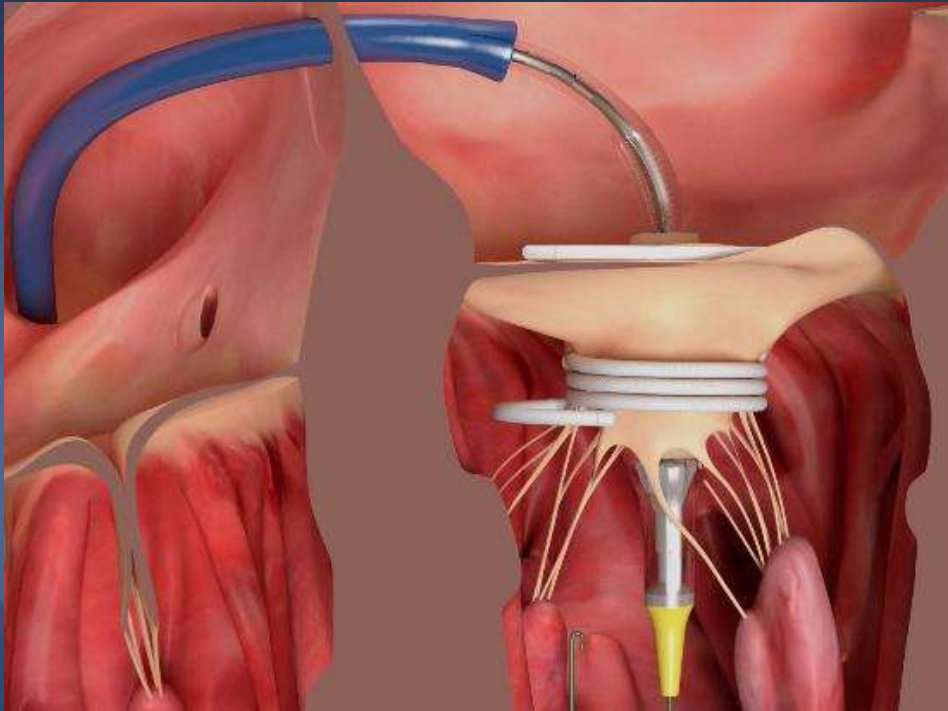
Valve



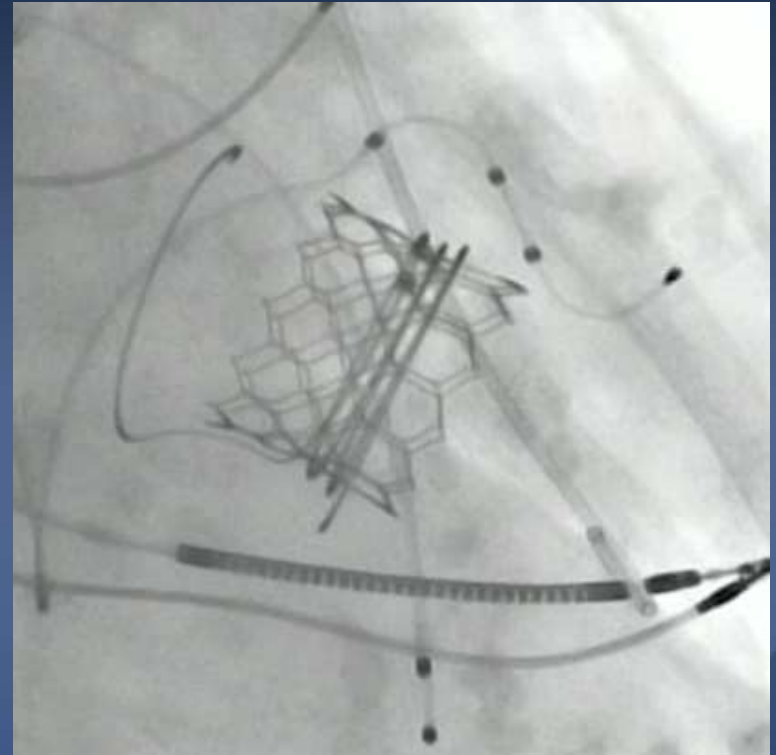
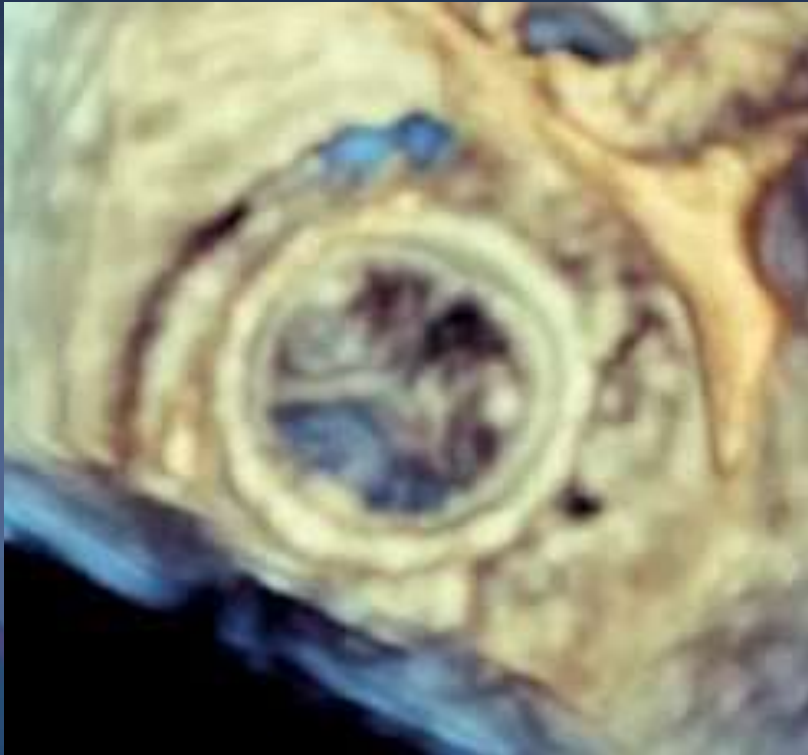
Caisson: transseptal



Edwards SAPIEM M3: transseptal TMVR



Edwards SAPIEM M3: transseptal TMVR



Different patients will require different therapies

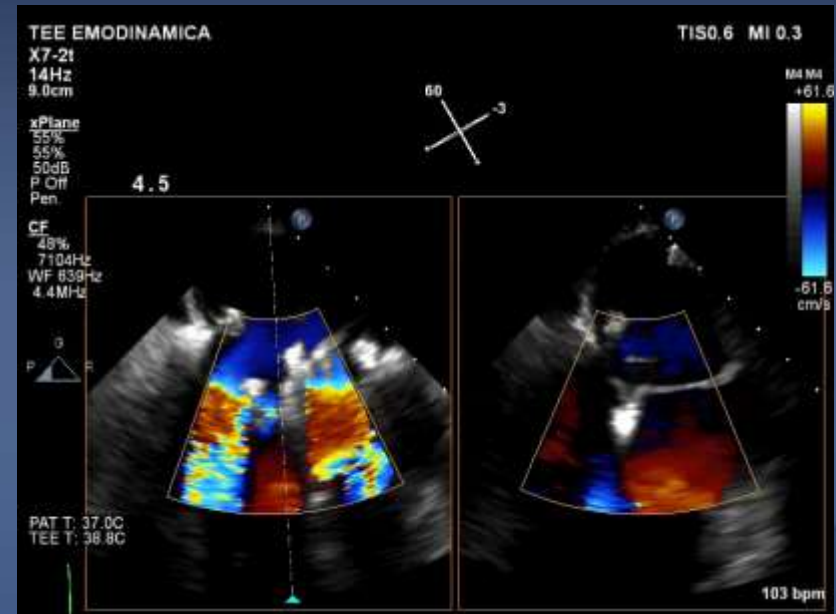
PATHOLOGY		REPAIR				REPLACE
		Leaflet	Annular	Chordal	LV remodel	
Leaflet	redundant	✓		✓		✓
	torn	✓		✓		✓
	perforated					✓
	calcified					✓
Chord	tethered	✓	✓		✓	✓
	torn			✓		✓
Annulus	dilated	✓	✓	✓	✓	✓
	calcified					✓

Some patients will require combination therapy

Pre

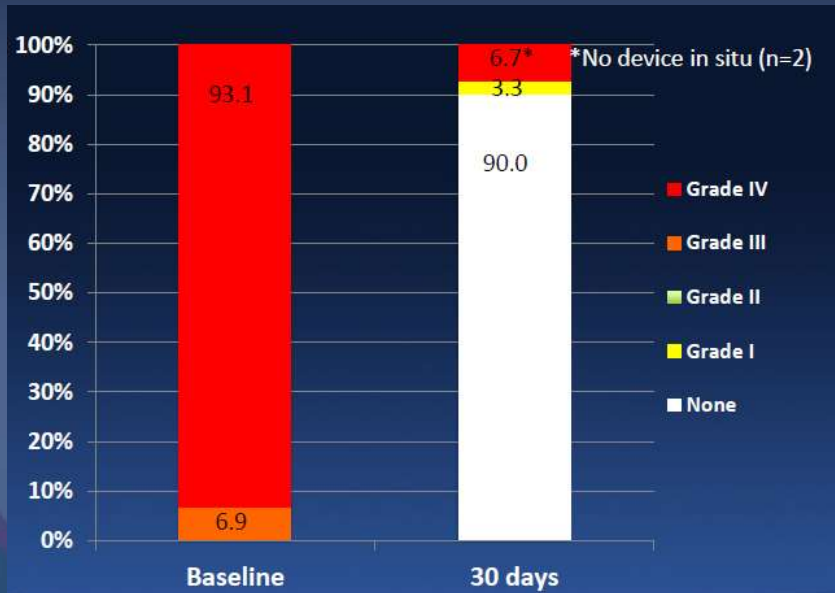


Cardioband and Mitraclip



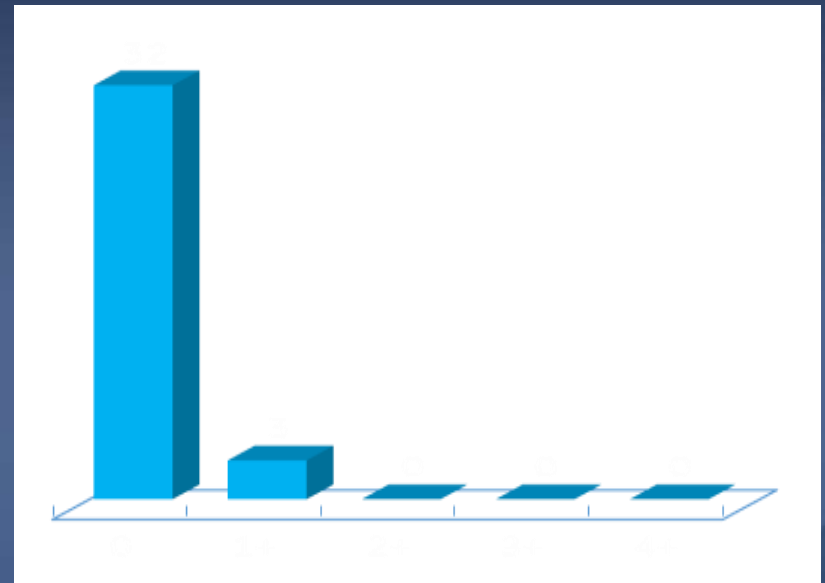
TMVR is more effective in reducing MR than Repair

Tendyne



MR grade at latest follow-up

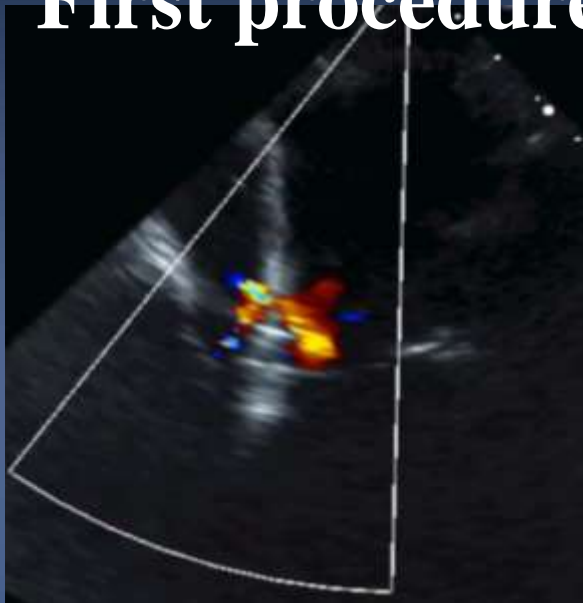
Intrepid



MR grade at latest follow-up

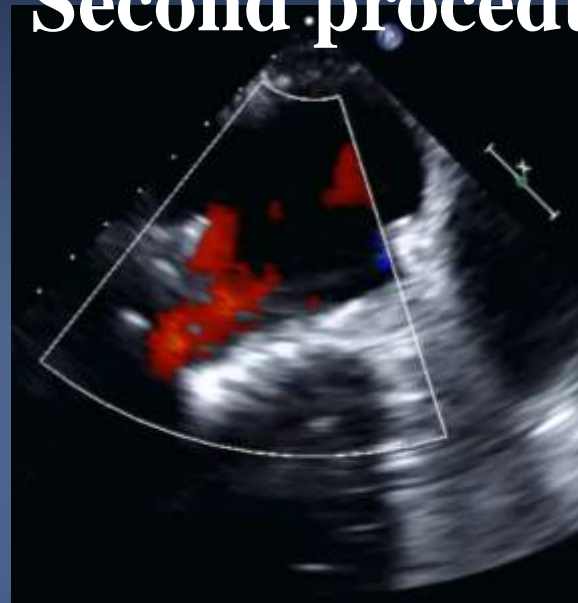
TMVI: the potential for reproducible, single stage, effective, and durable benefits

First procedure



Mitraclip after 4 hours
(clip removed)

Second procedure



TMVR after 30 min

Mitral therapies are becoming main stream

Last week in Vancouver

- TAVI x9
- Tiara TMVR x2
- SAPIEN M3 TMVR
- Mitraclip
- Pascal
- Mitral balloon valvuloplasty



Centre for
Heart Valve Innovation
St. Paul's Hospital, Vancouver

End