Transcatheter Mitral Valve in Valve Implantation: Why, When, and How

Alfredo G. Cerillo
Fondazione Toscana G. Monasterio
Massa

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Mitral VIV: Why?

- Redo mitral valve replacement may be a hard challenge
  - Complex
  - Traumatic
  - High morbidity
  - High mortality

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

MIS and REDO MVS

Table 2. Principal data of the relevant papers about outcomes of minimally invasive approach for redo mitral surgery.

First author, year of publication	Study period	No. of pts	Mean age (years)	Previous surgery	Mean time to redo surgery (years)	ECC & myocardial protection	Conversion to sternotomy	MVP/MVR	Stroke	In-hospital/ 30-day death (%)	Mean hospital stay (days)	Wound infection
Romano, 2012, (28)	1996-2011	450	63	CABG 74.7%; MV 30.2%	6.5	AscA/FA-Bic; BH 70.4% VF 29.6%	NA	65.4%/34.6%	2.8%	6.9%	7.1	NA
Arcidi, 2012, (23)	1996-2010	167	66.9	CABG 71%; previous valve 38%	NA	FA/AA-FV/JV, VF 77%, Chitwood clamp and root plegia 23%	0	61.7%/38.3%	2.4%	3%	6	0.6%
Botta, 2012, (2)	2008-2010	19	64.5	MVR 52.6%, CABG 36.8%, MVP 10.6%	5.5	AsA/FA-FV/JF/Bic, VF 70%, BH 30%	4.5%	10.5%/89.5%	4.5%	5.2%	8	0
Ricci, 2010, (26)	1997-2007	241	61	MVR 38%, MVP 27%, other (non mitral) 35%	NA	FAAscA-FV Endoclamp/ VF 2.5%	0.8%	23.2%/65.5%, (other 11.3%)	5.8%	4.9%	8	1.6%
Seeburger, 2009, (3)	1998-2008	181	64.5	CABG 42%, isolated valve 30%, valve + CABG 9%, other 19%	NA	FA-FV, VF 77.3% Clamp17.1, BH 5.5%	1.7%	60%/40%	3.8%	6.6%	16.3	NA
Murzi, 2009, (29)	2003-2008	25	71.8	CABG + MV 48%, CABG 44%, CABG + AV 8%	8.6	FA-FV	0	60%/40%	0	4%	10.6	0
Casselman, 2007, (24)	1997-2006	80	65	MV 39%, CABG 29%, congenital 10%, other 22%	15	FA-FV, endoclamp	6.25%	45%/50% (other 5%)	2.5%	3.8%	10.7	1.3%
Sharoni, 2006 (25)	1995-2002	100	NA	NA	NA	FA/AscA-FV; ext clamp or endoclamp	0	31%/69%	2.5%	5%	NA	0
Cohn, 2004 (15)	1992-2002	145	NA	CABG 53.8%, AVR 22.1%, other 24.1%	NA	FA-FV, unclamped aorta	0	NA	NA	11%	NA	NA
Thompson, 2003 (4)	1985-2001	125	63	MVR 100 (+ CABG 16.6%)	NA	FA/AscA-Bic, BH 100%	NA	0%/100%	1.6%	6.4%	12	4.8%

Data are expressed as absolute numbers or percentages. No. of pts, number of patients; CABG, coronary artery bypass grafting; MV, mitral valve; MVP, mitral valve plasty; MVR, mitral valve replacement; AVR, aortic valve replacement; ECC, extra-corporeal circulation; FA, femoral artery; AscA, ascending aorta; AA, axillary artery; FV, femoral vein; Bic, bicaval; JV, jugular vein; VF, ventricular fibrillation; BH, beating heart; Clamp, aortic clamping; NA, not available.

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

MIS and REDO MVS

Table 2. Principal data of the relevant papers about outcomes of minimally invasive approach for redo mitral surgery.

First author, year of publication	Study period	No. of pts	Mean age (years)	Previous surgery	Mean time to redo surgery (years)	ECC & myocardial protection	Conversion to sternotomy	MVP/MVR	Stroke	In-hospital/ 30-day death (%)	Mean hospital stay (days)	Wound infection
Romano, 2012, (28)	1996-2011	450	63	CABG 74.7%; MV 30.2%	6.5	AscA/FA-Bic; BH 70.4% VF 29.6%	NA	65.4%/34.6%	2.8%	6.9%	7.1	NA
Arcidi, 2012, (23)	1996-2010	167	66.9	CABG 71%; previous valve 38%	NA	FA/AA-FV/JV, VF 77%, Chitwood clamp and root plegia 23%	0	61.7%/38.3%	2.4%	3%	6	0.6%
Botta, 2012, (2)	2008-2010	19	64.5	MVR 52.6%, CABG 36.8%, MVP 10.6%	5.5	AsA/FA-FV/JF/Bic, VF 70%, BH 30%	4.5%	10.5%/89.5%	4.5%	5.2%	8	0
Ricci, 2010, (26)	1997-2007	241	61	MVR 38%, MVP 27%, other (non mitral) 35%	NA	FAAscA-FV Endoclamp/ VF 2.5%	0.8%	23.2%/65.5%, (other 11.3%)	5.8%	4.9%	8	1.6%
Seeburger, 2009, (3)	1998-2008	181	64.5	CABG 42%, isolated valve 30%, valve + CABG 9%, other 19%	NA	FA-FV, VF 77.3% Clamp17.1, BH 5.5%	1.7%	60%/40%	3.8%	6.6%	16.3	NA
Murzi, 2009, (29)	2003-2008	25	71.8	CABG + MV 48%, CABG 44%, CABG + AV 8%	8.6	FA-FV	0	60%/40%	0	4%	10.6	0
Casselman, 2007, (24)	1997-2006	80	65	MV 39%, CABG 29%, congenital 10%, other 22%	15	FA-FV, endoclamp	6.25%	45%/50% (other 5%)	2.5%	3.8%	10.7	1.3%
Sharoni, 2006 (25)	1995-2002	100	NA	NA	NA	FA/AscA-FV; ext clamp or endoclamp	0	31%/69%	2.5%	5%	NA	0
Cohn, 2004 (15)	1992-2002	145	NA	CABG 53.8%, AVR 22.1%, other 24.1%	NA	FA-FV, unclamped aorta	0	NA	NA	11%	NA	NA
Thompson, 2003 (4)	1985-2001	125	63	MVR 100 (+ CABG 16.6%)	NA	FA/AscA-Bic, BH 100%	NA	0%/100%	1.6%	6.4%	12	4.8%

Data are expressed as absolute numbers or percentages. No. of pts, number of patients; CABG, coronary artery bypass grafting; MV, mitral valve; MVP, mitral valve plasty; MVR, mitral valve replacement; AVR, aortic valve replacement; ECC, extra-corporeal circulation; FA, femoral artery; AscA, ascending aorta; AA, axillary artery; FV, femoral vein; Bic, bicaval; JV, jugular vein; VF, ventricular fibrillation; BH, beating heart; Clamp, aortic clamping; NA, not available.

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

MIS and REDO MVS

Table 2. Principal data of the relevant papers about outcomes of minimally invasive approach for redo mitral surgery.

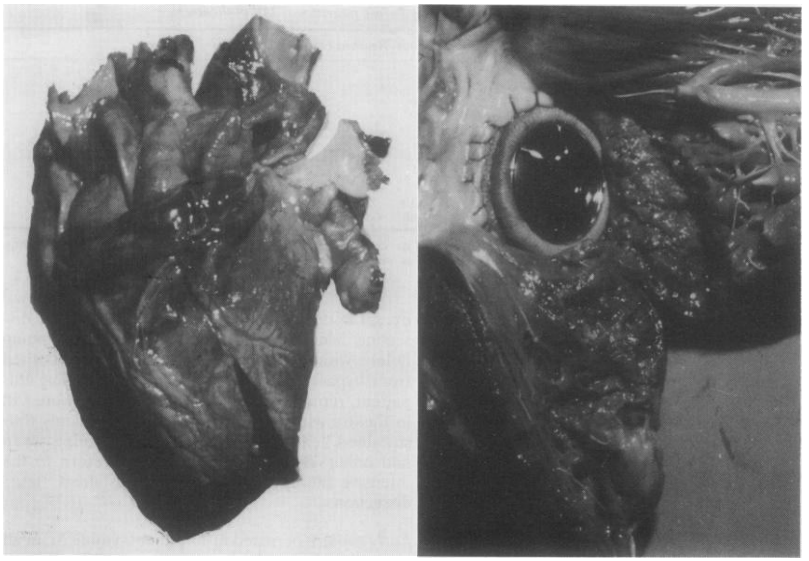
First author, year of publication	Study period	No. of pts	Mean age (years)	Previous surgery	Mean time to redo surgery (years)	ECC & myocardial protection	Conversion to sternotomy	MVP/MVR	Stroke	In-hospital/ 30-day death (%)	Mean hospital stay (days)	Wound infection
Romano, 2012, (28)	1996-2011	450	63	CABG 74.7%; MV 30.2%	6.5	AscA/FA-Bic; BH 70.4% VF 29.6%	NA	65.4%/34.6%	2.8%	6.9%	7.1	NA
Arcidi, 2012, (23)	1996-2010	167	66.9	CABG 71%; previous valve 38%	NA	FA/AA-FV/JV, VF 77%, Chitwood clamp and root plegia 23%	0	61.7%/38.3%	2.4%	3%	6	0.6%
Botta, 2012, (2)	2008-2010	19	64.5	MVR 52.6%, CABG 36.8%, MVP 10.6%	5.5	AsA/FA-FV/JF/Bic, VF 70%, BH 30%	4.5%	10.5%/89.5%	4.5%	5.2%	8	0
Ricci, 2010, (26)	1997-2007	241	61	MVR 38%, MVP 27%, other (non mitral) 35%	NA	FAAscA-FV Endoclamp/ VF 2.5%	0.8%	23.2%/65.5%, (other 11.3%)	5.8%	4.9%	8	1.6%
Seeburger, 2009, (3)	1998-2008	181	64.5	CABG 42%, isolated valve 30%, valve + CABG 9%, other 19%	NA	FA-FV, VF 77.3% Clamp17.1, BH 5.5%	1.7%	60%/40%	3.8%	6.6%	16.3	NA
Murzi, 2009, (29)	2003-2008	25	71.8	CABG + MV 48%, CABG 44%, CABG + AV 8%	8.6	FA-FV	0	60%/40%	0	4%	10.6	0
Casselman, 2007, (24)	1997-2006	80	65	MV 39%, CABG 29%, congenital 10%, other 22%	15	FA-FV, endoclamp	6.25%	45%/50% (other 5%)	2.5%	3.8%	10.7	1.3%
Sharoni, 2006 (25)	1995-2002	100	NA	NA	NA	FA/AscA-FV; ext clamp or endoclamp	0	31%/69%	2.5%	5%	NA	0
Cohn, 2004 (15)	1992-2002	145	NA	CABG 53.8%, AVR 22.1%, other 24.1%	NA	FA-FV, unclamped aorta	0	NA	NA	11%	NA	NA
Thompson, 2003 (4)	1985-2001	125	63	MVR 100 (+ CABG 16.6%)	NA	FA/AscA-Bic, BH 100%	NA	0%/100%	1.6%	6.4%	12	4.8%

Data are expressed as absolute numbers or percentages. No. of pts, number of patients; CABG, coronary artery bypass grafting; MV, mitral valve; MVP, mitral valve plasty; MVR, mitral valve replacement; AVR, aortic valve replacement; ECC, extra-corporeal circulation; FA, femoral artery; AscA, ascending aorta; AA, axillary artery; FV, femoral vein; Bic, bicaval; JV, jugular vein; VF, ventricular fibrillation; BH, beating heart; Clamp, aortic clamping; NA, not available.

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

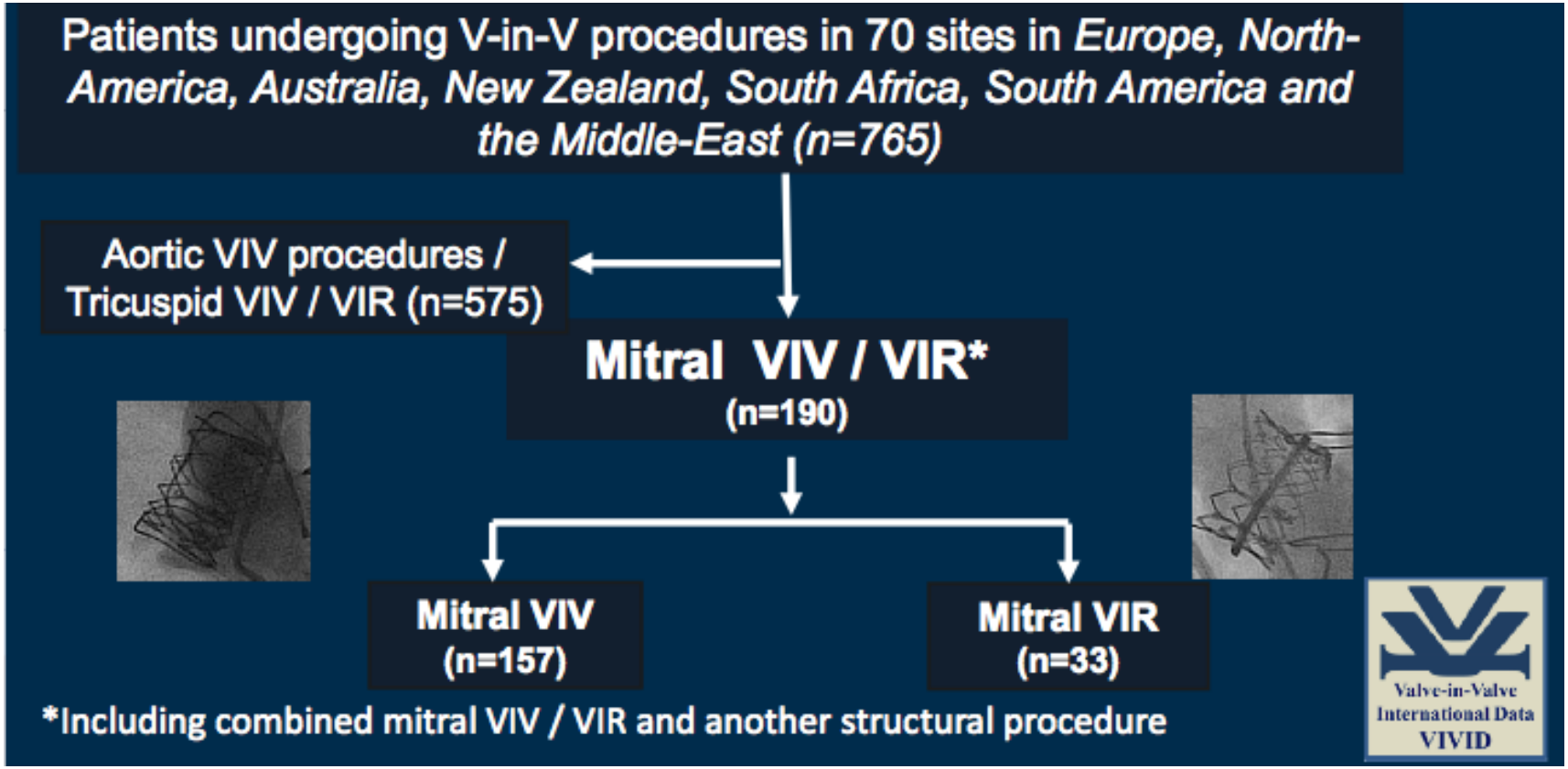
Mitral VIV: When?

- Reduce the surgical trauma
- Avoid removal of the malfunctioning prosthesis
- As an alternative to MIS, to avoid
  - Bad exposure
  - Bad tissues
  - Bad patients



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

The VIVID Registry



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

*Dvir D, AATS Meeting, 2014

The VIVID Registry

30-day Outcomes

Mitral VIV / VIR Procedures (n=190)

All-cause death	8.9%
Cardiovascular death	6.8%
Major stroke	2.2%
Major vascular complication	4.2%
Major/ life-threatening bleeding	13.2%
Acute kidney injury (≥type II)	18.6%
Median hospital stay (days)	8

Valve-in-Valve International Data VIVID

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

*Dvir D, AATS Meeting, 2014

The VIVID Registry

- 190 patients @ 23 centers
- Several different approaches
- Wide range of malfunctioning prostheses / rings treated

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

*Dvir D, AATS Meeting, 2014

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 ($p < 0.01$). Intervalvular 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)

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

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 ($p < 0.01$). Intervalvular 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)

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Mitral Valve in valve implantation In Massa

- 17 high risk patients
- STS score (mean) : 13.7
- Prosthesis size : 25 – 31
- Prosthesis age : 1-12 years
- Modes of failure :
  - Stenosis 3
  - Regurgitation 2
  - Mixed 12

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Mitral Valve in valve implantation In Massa

- The 1st patient died
  - Wrong implantation height
  - Overall mortality 5.8%
- One patient developed a LV pseudoaneurysm
- 16 patients discharged
  - Mean gradient 4.4 mmHg
  - 2 patients with < 2+ Intervalvular regurgitation

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

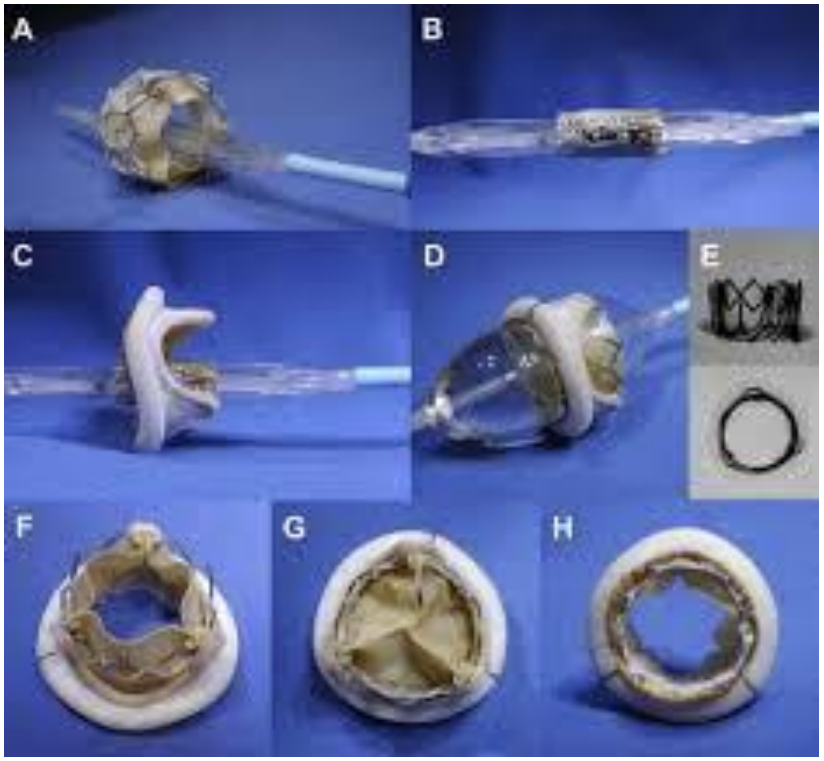
Valve in valve implantation as a « Routine » procedure

- Several cases described
- Quickly growing experience
- New tools available

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Valve in valve implantation as a « Routine » procedure

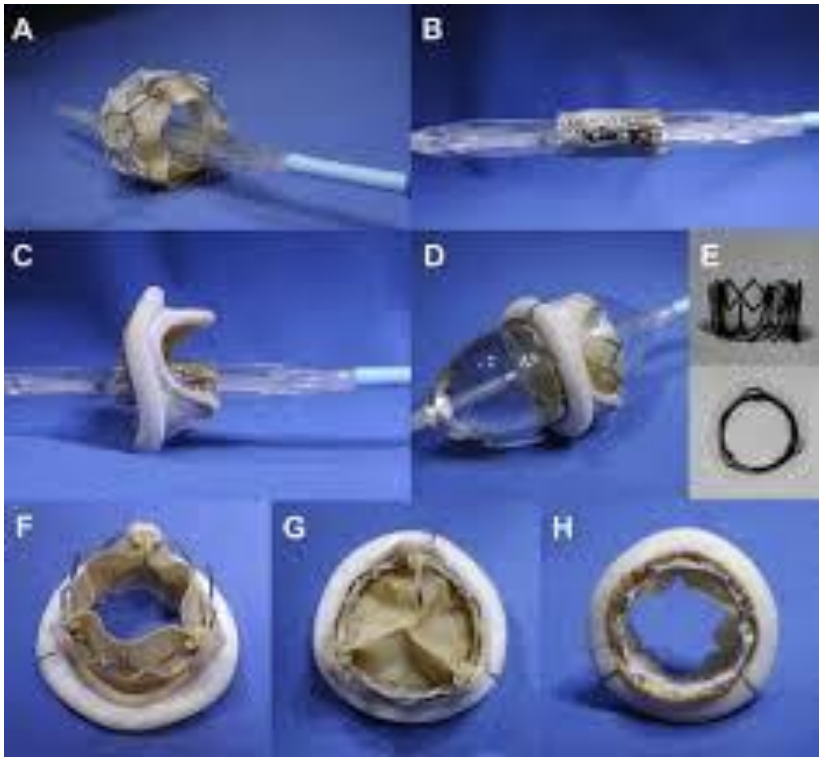
- Right patient
- Right Approach
- Careful planning
- Right technique



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

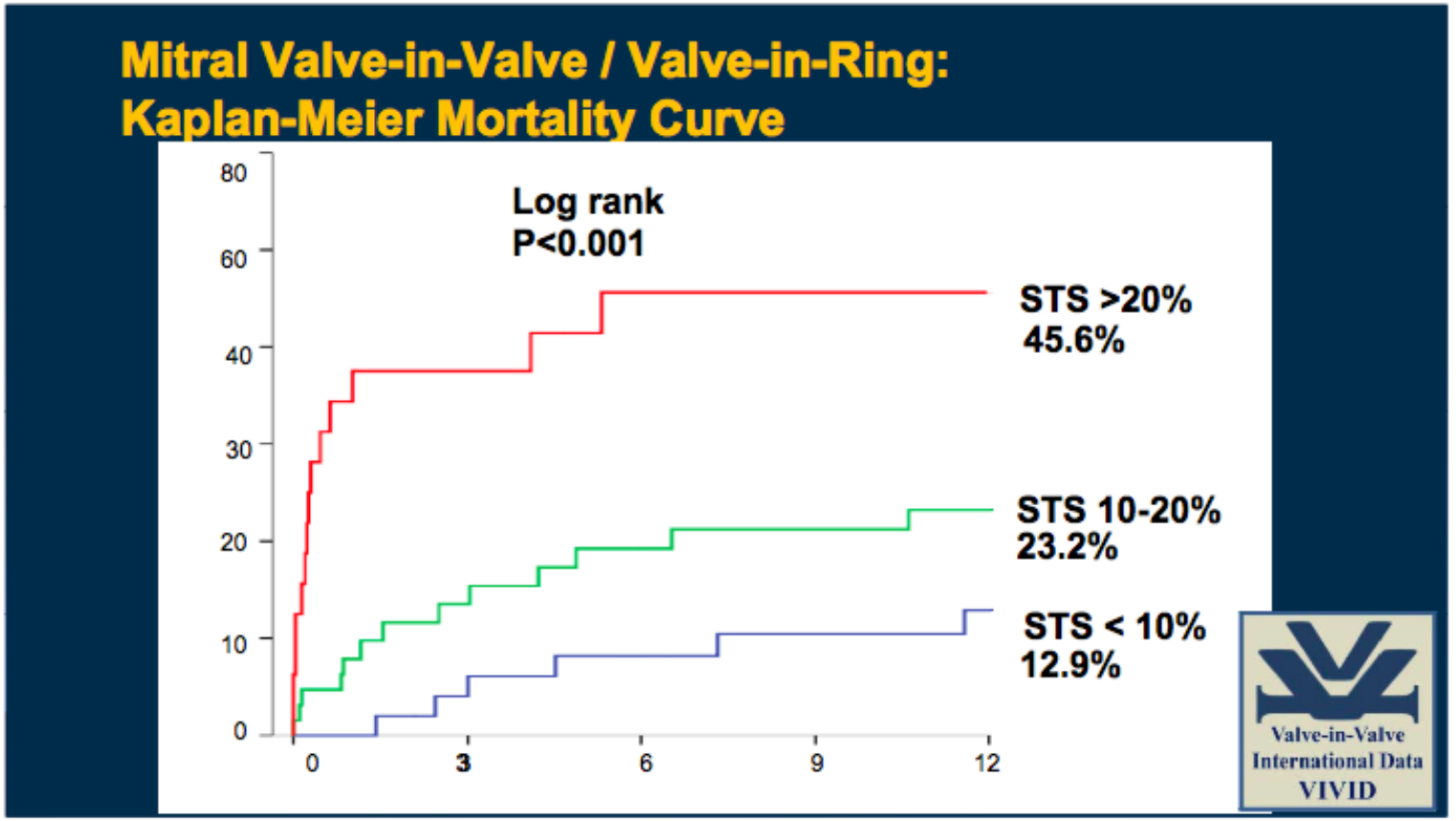
Valve in valve implantation as a « Routine » procedure

- Right patient
- Right Approach
- Careful planning
- Right technique



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

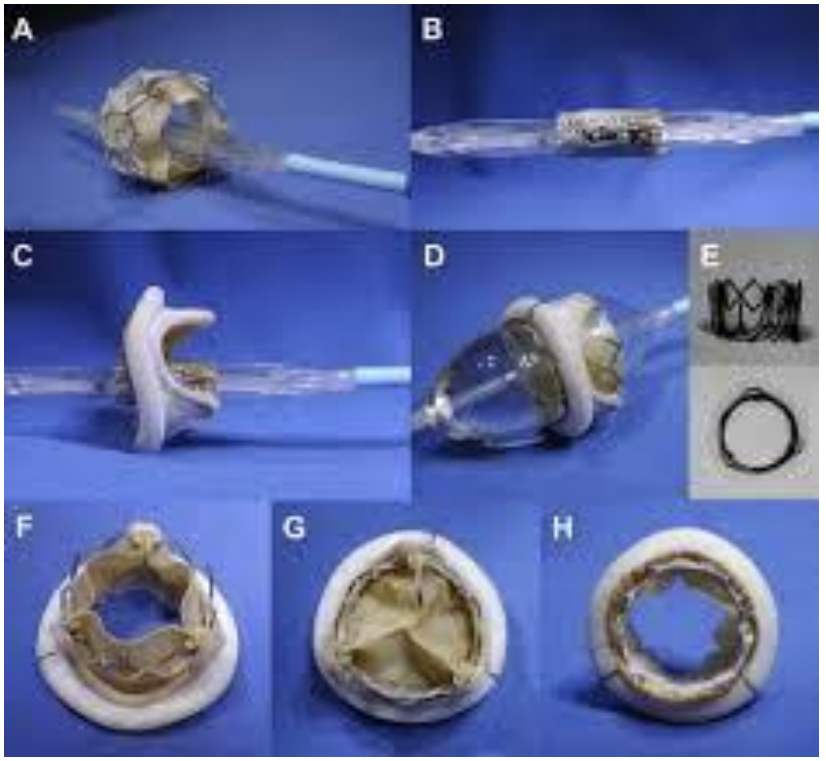
Avoid futile procedures!



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

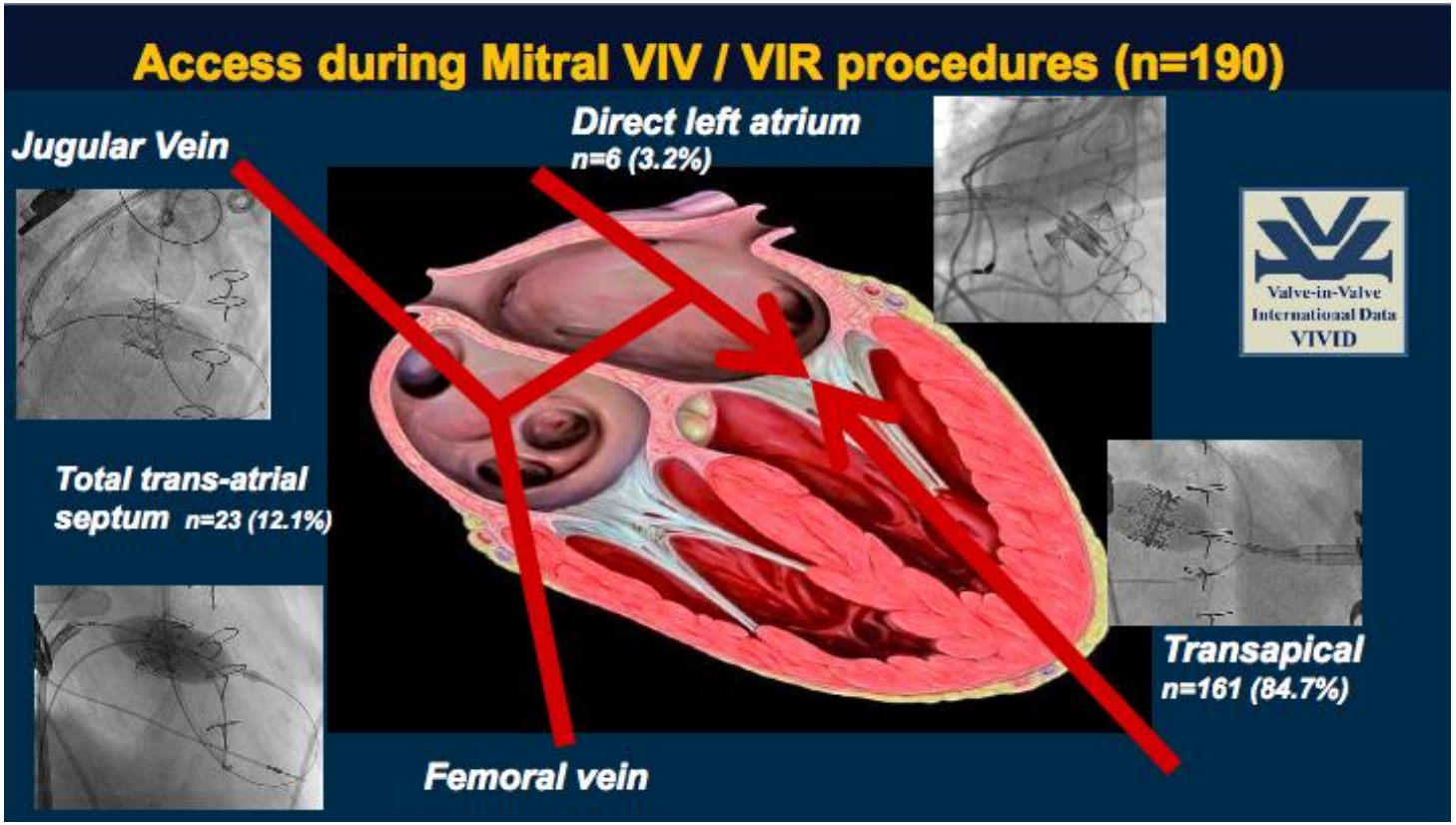
Valve in valve implantation as a « Routine » procedure

- Right patient
- Right Approach
- Careful planning
- Right technique



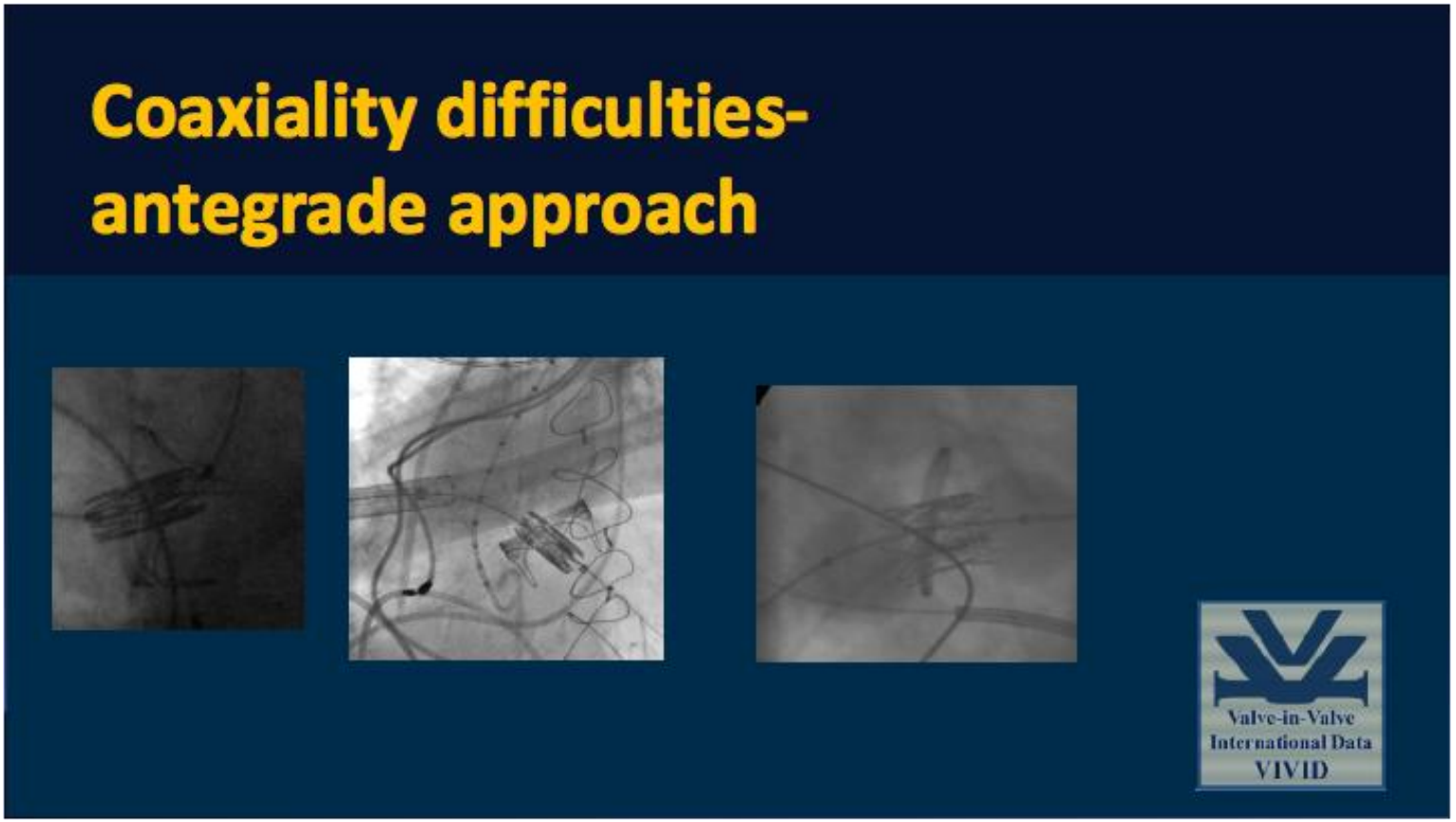
Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Choosing the access: evidence from The VIVID Registry



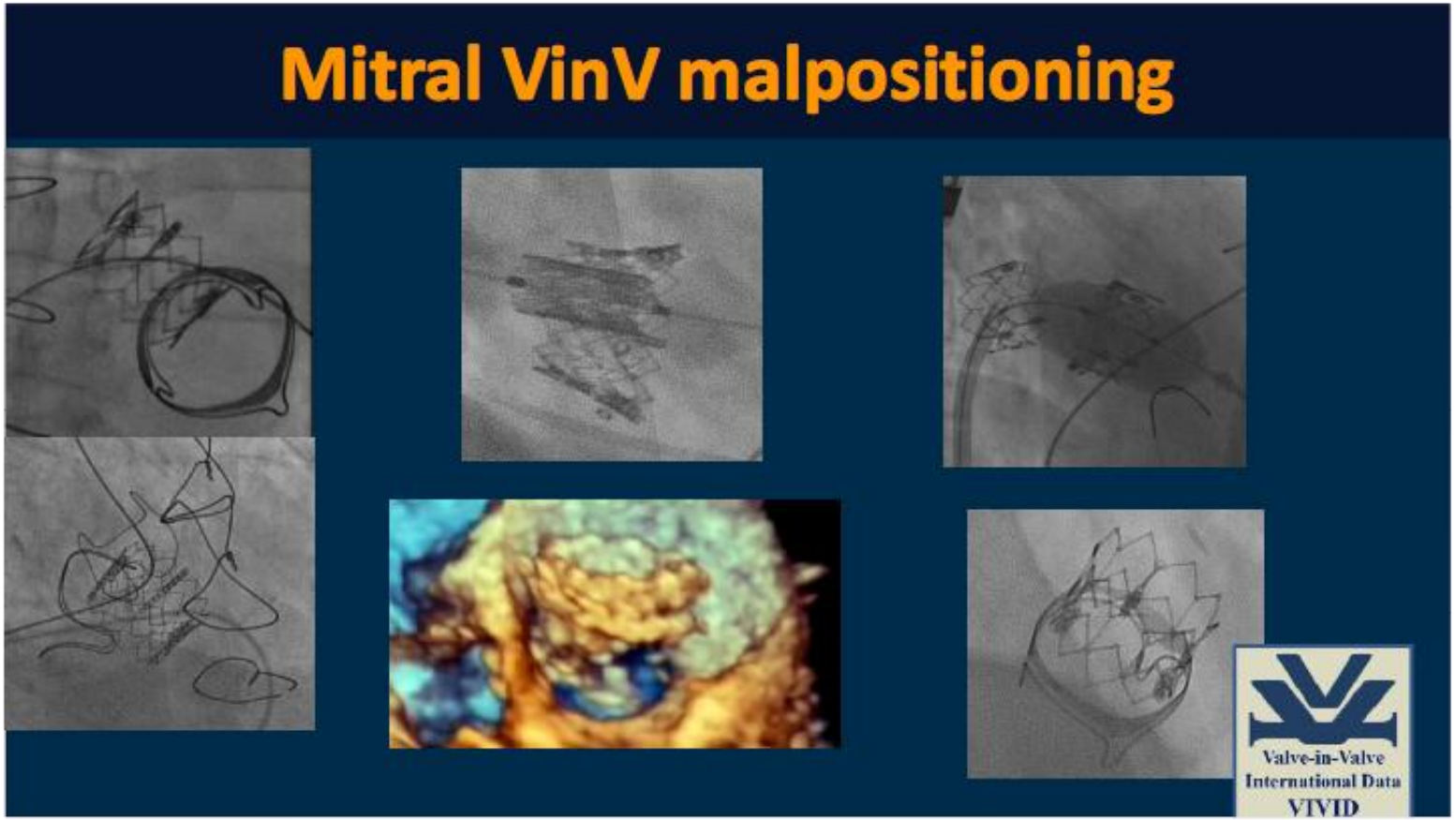
*Dvir D, AATS Meeting, 2014

Choosing the access: evidence from The VIVID Registry



*Dvir D, AATS Meeting, 2014

Choosing the access: evidence from The VIVID Registry



*Dvir D, AATS Meeting, 2014

Transfemoral Implantation of Transcatheter Heart Valves After Deterioration of Mitral Bioprosthesis or Previous Ring Annuloplasty

Claire Bouleti, MD, PhD*; Amir-Ali Fassa, MD*; Dominique Himbert, MD*; Eric Brochet, MD*; Gregory Ducrocq, MD*; Mohammed Nejjari, MD*; Walid Ghodbane, MD†; Jean-Pol Depoix, MD‡; Patrick Nataf, MD†; Alec Vahanian, MD*

Results Procedure was successful in 14 patients (82%). Two complications occurred during rescue procedures: 1 procedural death and 1 THV migration. One patient had moderate paraprosthetic regurgitation following the procedure, whereas residual regurgitation was trace or less in 11 patients (69%) and mild in 4 patients (25%). Mean gradient decreased from 12 ± 6 mm Hg to 8 ± 3 mm Hg. During a mean follow-up of 22 months, 4 patients died, 3 from cardiac cause. The 18-month survival was 68 ± 14% in the overall population and 78 ± 14% for patients with elective procedure. One patient underwent mitral valve replacement due to periprosthetic mitral regurgitation. At last follow-up, 12 patients were in New York Heart Association class ≤II (75%) and 4 in class III (25%).

J Am Coll Cardiol Intv. 2015;8(1_PA):83-91. doi:10.1016/j.jcin.2014.07.026

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Transfemoral Implantation of Transcatheter Heart Valves After Deterioration of Mitral Bioprosthesis or Previous Ring Annuloplasty

Claire Bouleti, MD, PhD*; Amir-Ali Fassa, MD*; Dominique Himbert, MD*; Eric Brochet, MD*; Gregory Ducrocq, MD*; Mohammed Nejjari, MD*; Walid Ghodbane, MD†; Jean-Pol Depoix, MD‡; Patrick Nataf, MD†; Alec Vahanian, MD*

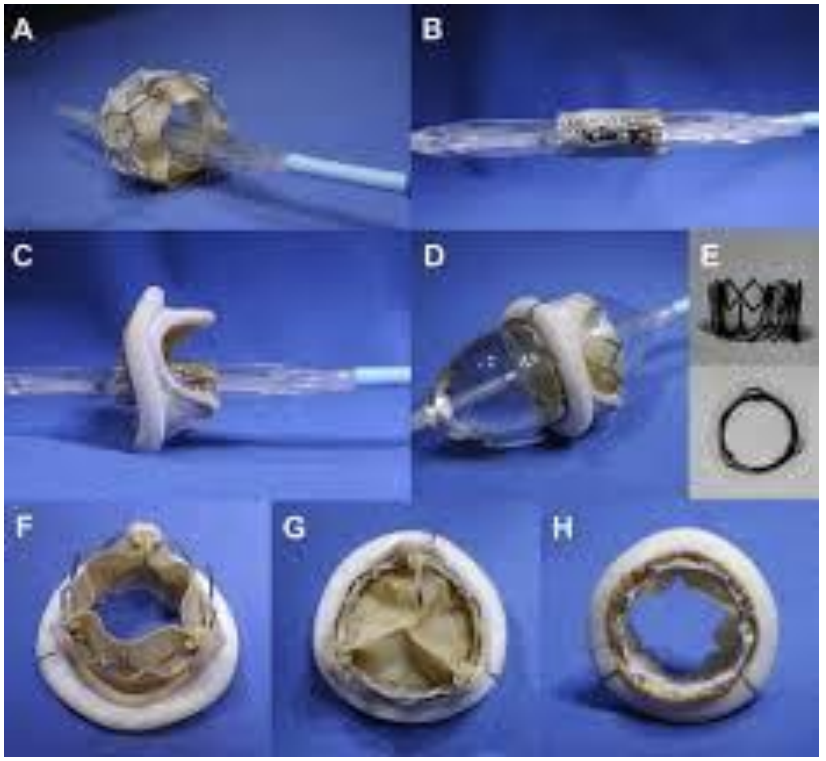
Results Procedure was successful in 14 patients (82%). Two complications occurred during rescue procedures: 1 procedural death and 1 THV migration. One patient had moderate paraprosthetic regurgitation following the procedure, whereas residual regurgitation was trace or less in 11 patients (69%) and mild in 4 patients (25%). Mean gradient decreased from 12 ± 6 mm Hg to 8 ± 3 mm Hg. During a mean follow-up of 22 months, 4 patients died, 3 from cardiac cause. The 18-month survival was 68 ± 14% in the overall population and 78 ± 14% for patients with elective procedure. One patient underwent mitral valve replacement due to periprosthetic mitral regurgitation. At last follow-up, 12 patients were in New York Heart Association class ≤II (75%) and 4 in class III (25%).

J Am Coll Cardiol Intv. 2015;8(1_PA):83-91. doi:10.1016/j.jcin.2014.07.026

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Valve in valve implantation as a « Routine » procedure

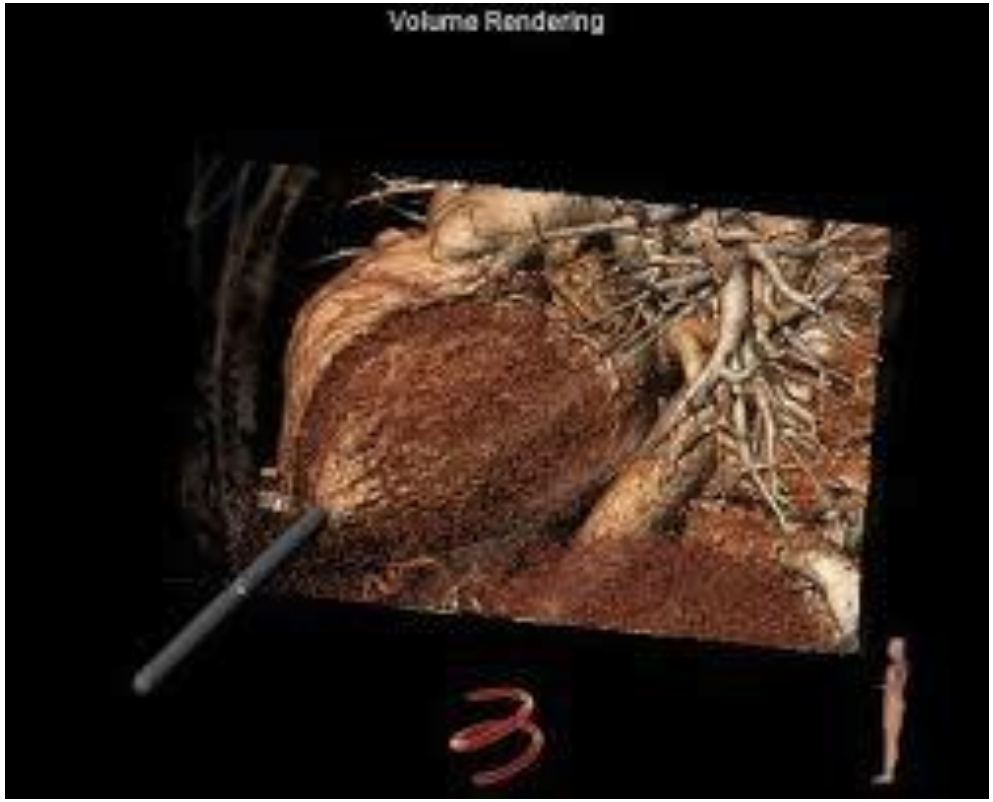
- Right patient
- Right Approach
- Careful planning
- Right technique



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Planning is crucial

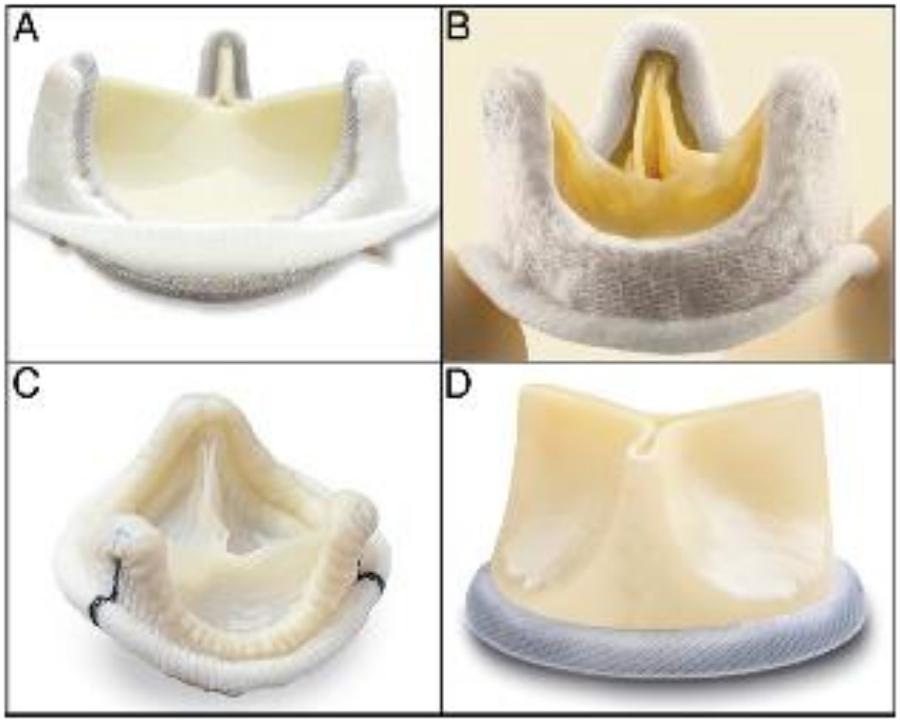
- CT-guided thoracotomy
- Target valve features
- Associated conditions



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

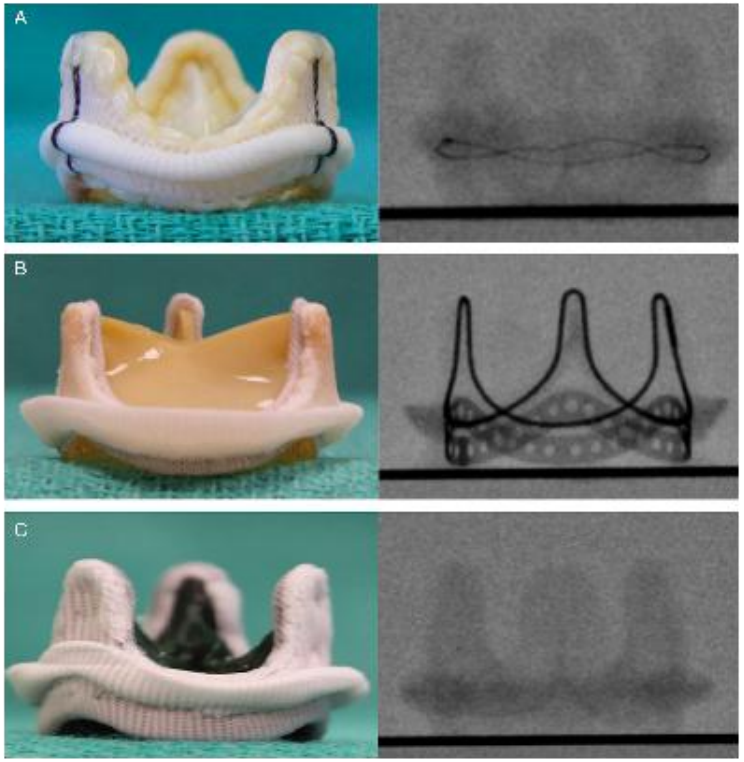
The target valve

- Dimensions
- Surgical anatomy
- Structural features



The target valve

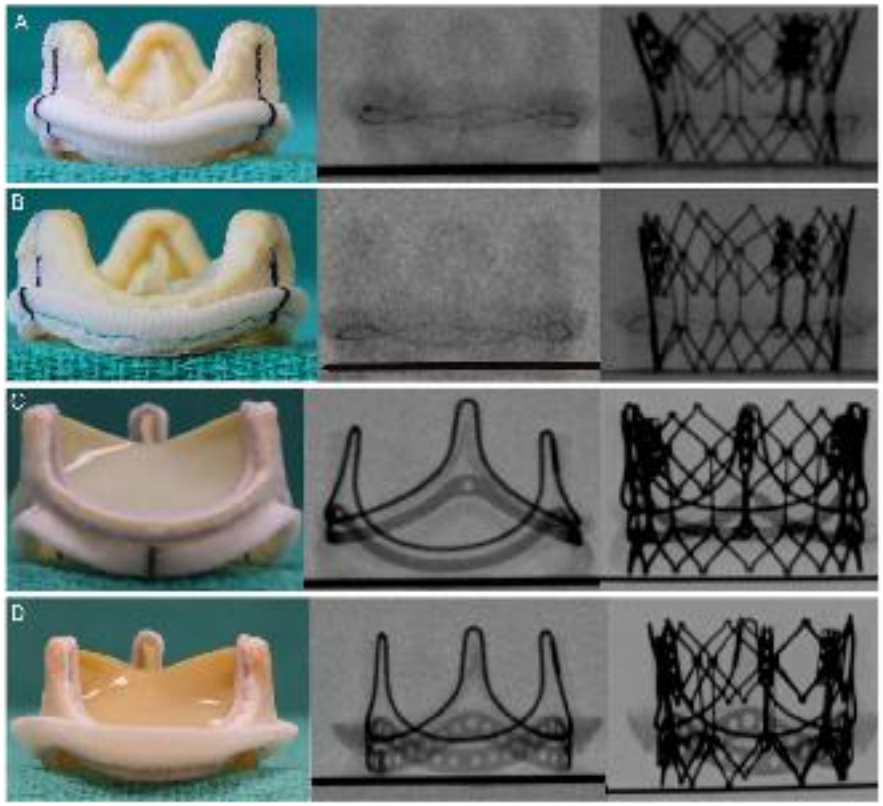
- Radiologic appearance
- Reaction to the balloon inflation
- Landing zone

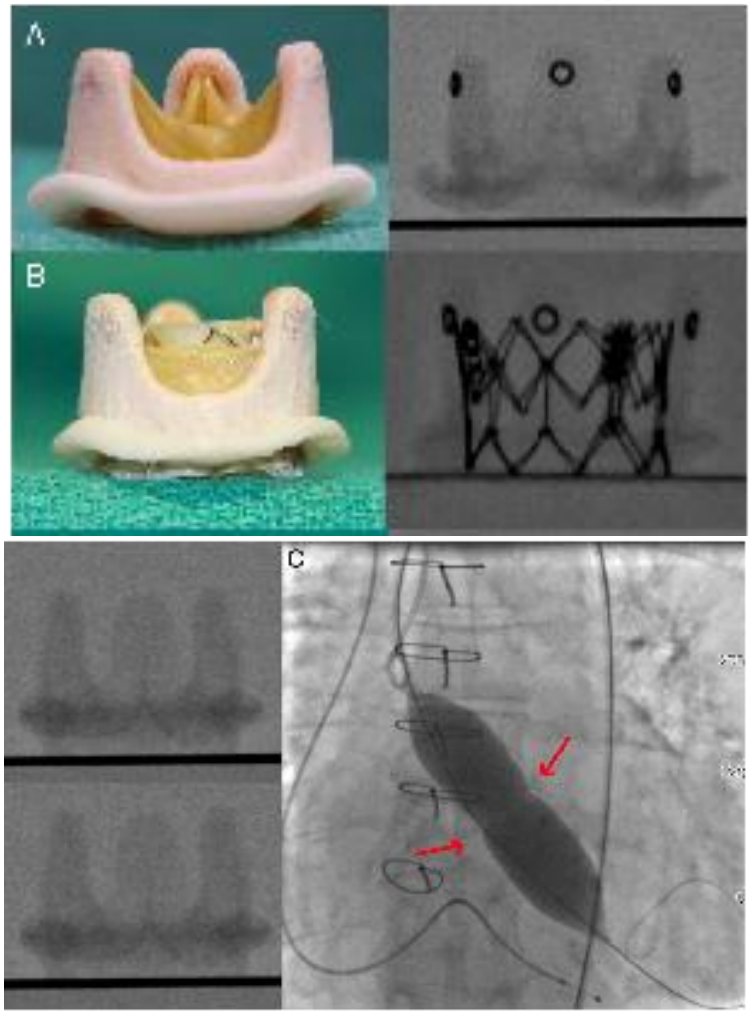


Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

The landing zone



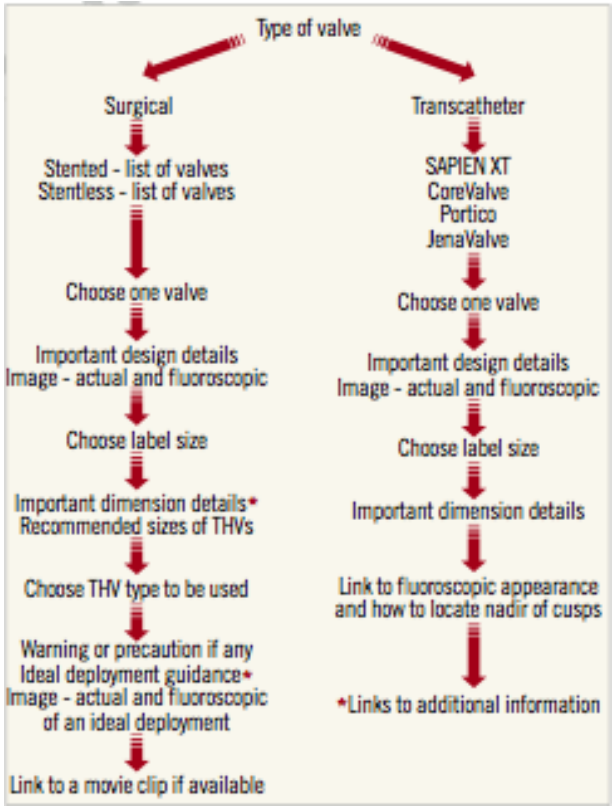


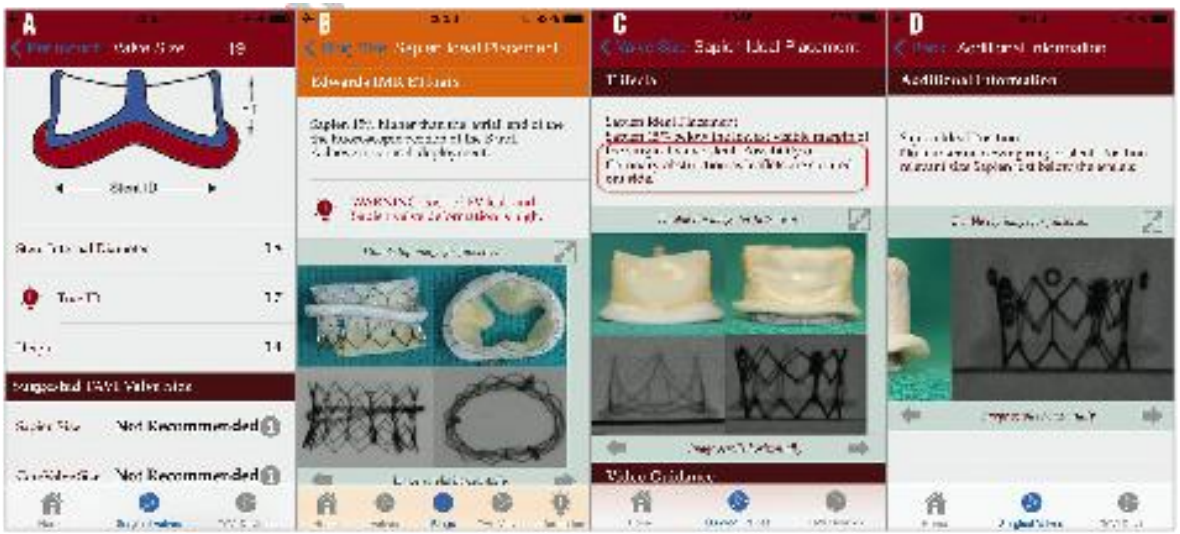
Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG

.

The Valve-in-valve apps





Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

The target valve:
A surgeon's perspective

- Modes of failure
- Calcium burden
- Sizing

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

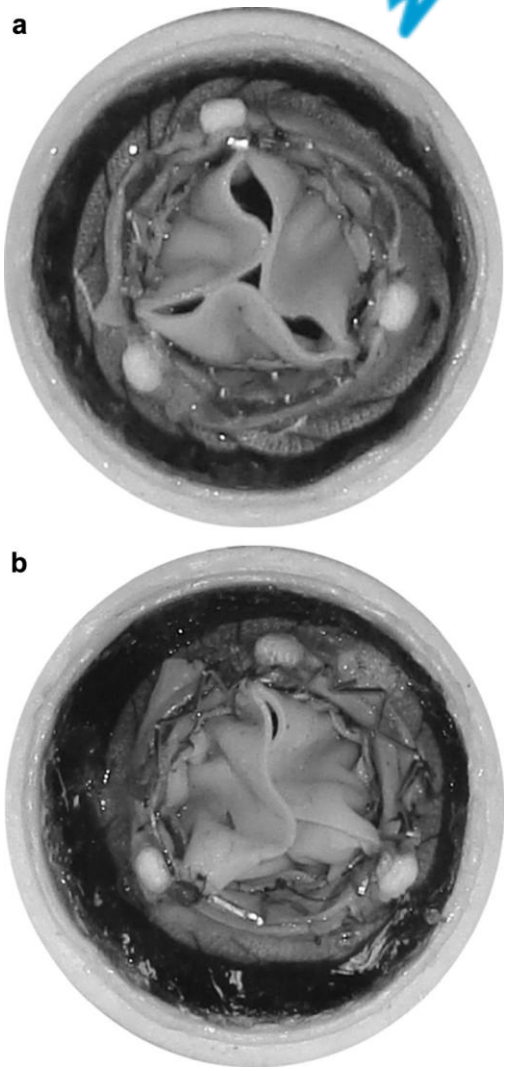
Sizing is crucial!

- Nominal internal diameter
- Echocardiography
- Literature Review / VIV app
- VIVID Registry
- CT Scan
- **Secure anchoring while avoiding excessive oversizing!**

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Planning the procedure: Sizing

- high gradients may be related to significant oversizing
- The role of incomplete expansion of the THV (Azadani 2010)

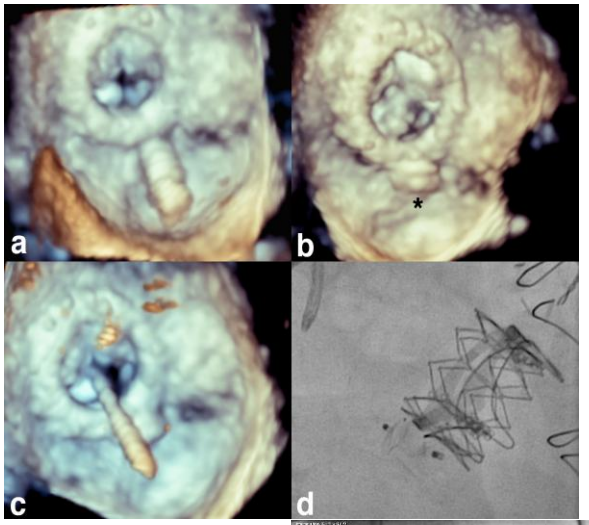


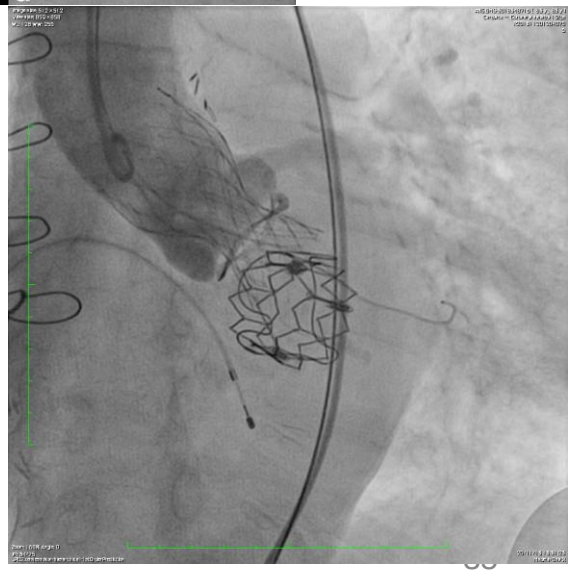
Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Planning: Associated conditions

- Double valve procedure

- PV leakage

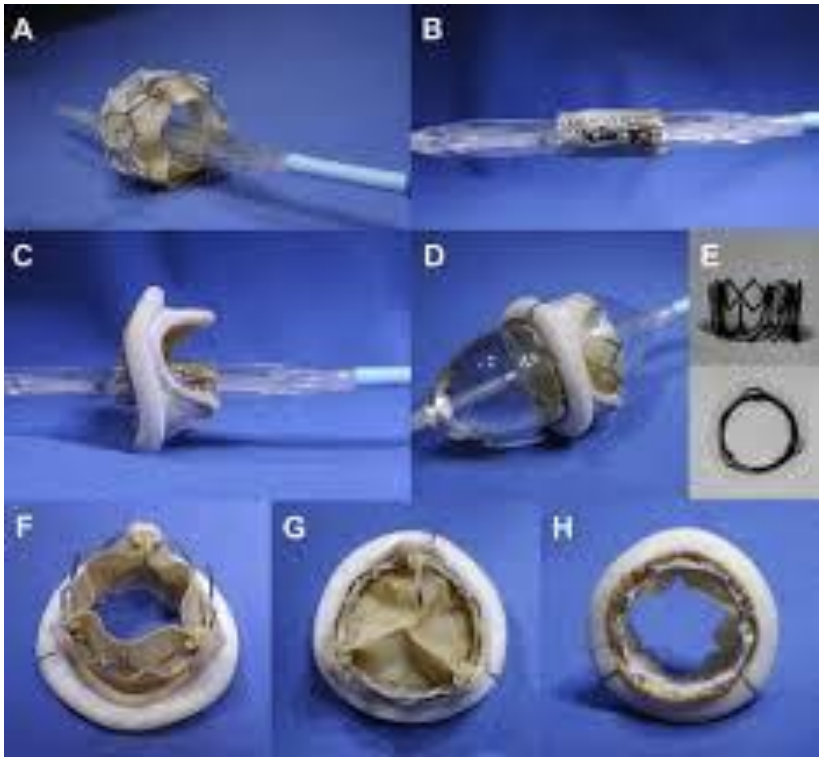




Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Valve in valve implantation as a « Routine » procedure

- Right patient
- Right Approach
- Careful planning
- Right technique



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Mitral Valve in valve implantation In Massa

- Always transapical
- Rapid pacing
- 20% - 80% A/V ratio
- Slow, 2 steps inflation

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Imaging for Mitral Valve in valve implantation

- Planning: CT

- Intraprocedural monitoring:
  - Angio
  - TEE (3D - real time)

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Case #1

Sapien XT 26 in Perimount 29

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore H.264
.

Case #2

Sapien XT 26 in Mosaic 29

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Case #3

Sapien XT 26 in Perimount 27

Sapien 3 in NAV

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Case #4

Sapien XT 29 in CE porcine 29

PV leak occlusion

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.


PHILIPS
TIS0.
OPA - Sala Operatoria
X7-2t/Adulti
FR 10Hz
11cm
Battiti 3D 1
2D
65%
C 55
P Off
Ris
0
160
180

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

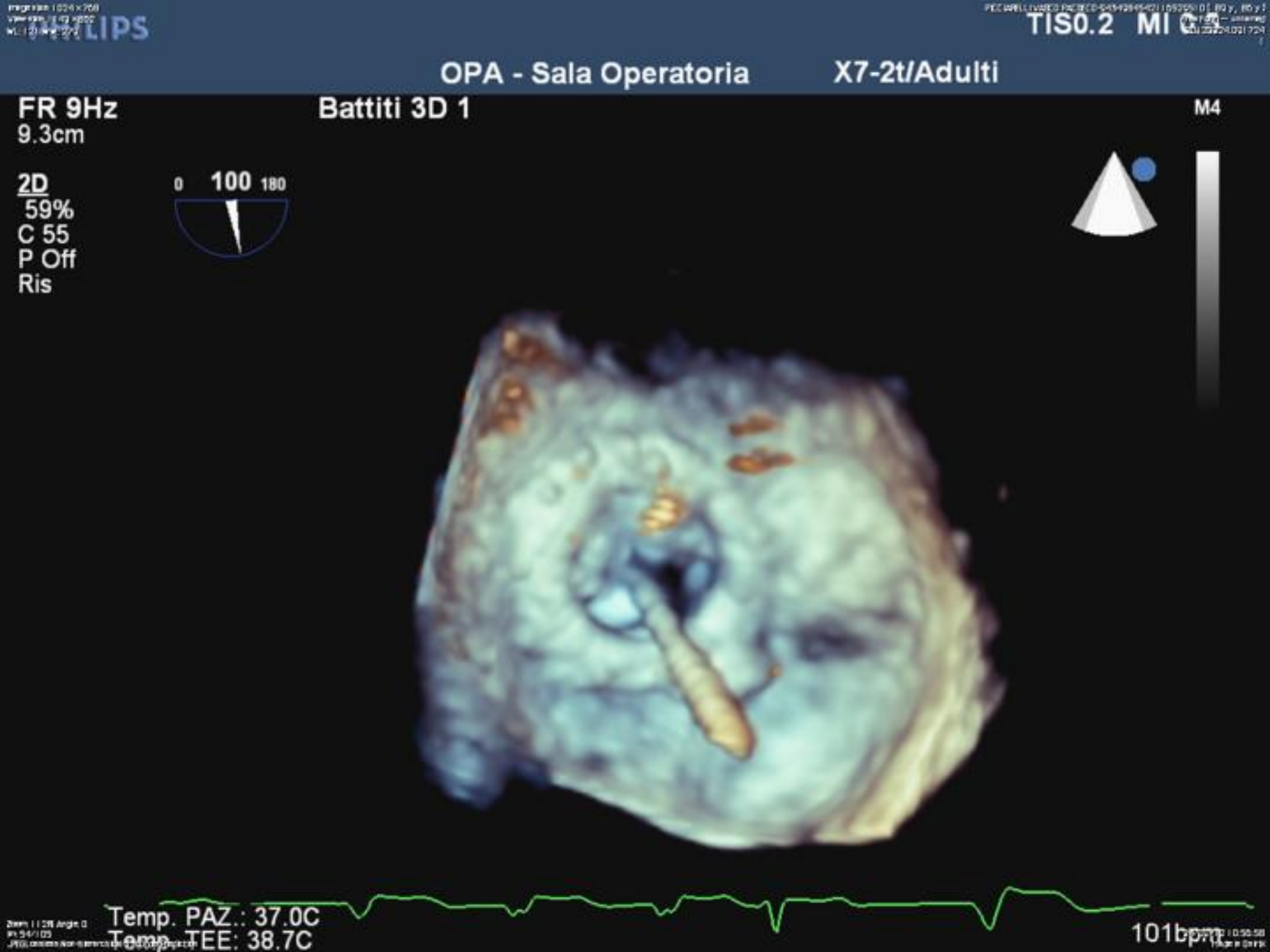
Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.


TIS0.1
OPA - Sala Operatoria
X7-2t/Adulti
FR 10Hz
11cm
Battiti 3D 1
M4
2D
65%
C 55
P Off
Ris
0
160
180
Temp. PAZ.: 37.0C

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.


PHILIPS
TIS0.1 MI
OPA - Sala Operatoria
X7-2t/Adulti
FR 9Hz
9.9cm
Battiti 3D 1
M4
2D
67%
C 55
P Off
Ris
0
165
180
Temp. PAZ.: 37.0C


TIS0.2 MI
OPA - Sala Operatoria X7-2t/Adulti
FR 9Hz
9.3cm
Battiti 3D 1
M4
2D
59%
C 55
P Off
Ris
0 100 180
Temp. PAZ.: 37.0C
Temp. TEE: 38.7C
101bpm

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore Photo - JPEG
.

Per visualizzare quest'immagine sono necessari QuickTime™ e un decompressore
.


TIS0.2 MI
OPA - Sala Operatoria
X7-2t/Adulti
FR 9Hz
9.0cm
Battiti 3D 1
M4
2D
50%
C 55
P Off
Gen.
0
115
180
Temp. PAZ.: 37.0C

Conclusion

- Transcatheter mitral VIV is EASY when
  - You study a lot (Planning)
  - You do it transapical (Surgeon)
  - You know how to inflate the balloon (Take your time)
- Mortality can be extremely reduced if you do the right thing in the right patient

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Thank you!

Alfredo G. Cerillo
Fondazione Toscana G. Monasterio
Massa

Back up slides

Alfredo G. Cerillo
Fondazione Toscana G. Monasterio
Massa

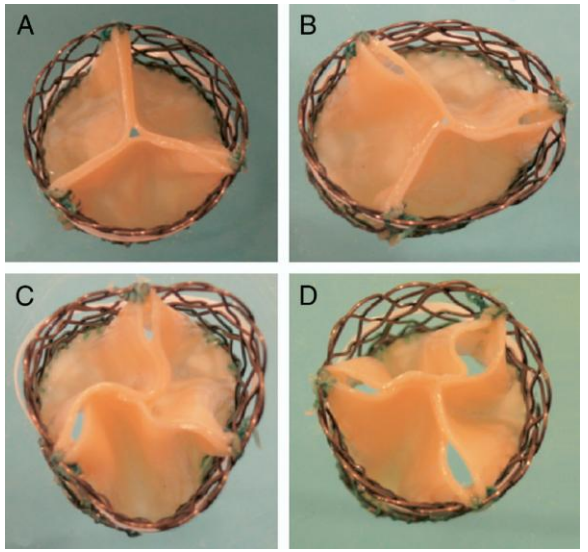
Mitral Valve in valve implantation In Massa

- Follow up (4 – 48 months) 100% complete
- 2 « Late Deaths »
  - Pneumonia (1 month)
  - Endocarditis (8 months)
- 1 ischaemic stroke (38 months) with good functional recovery
- All NYHA ≤ II

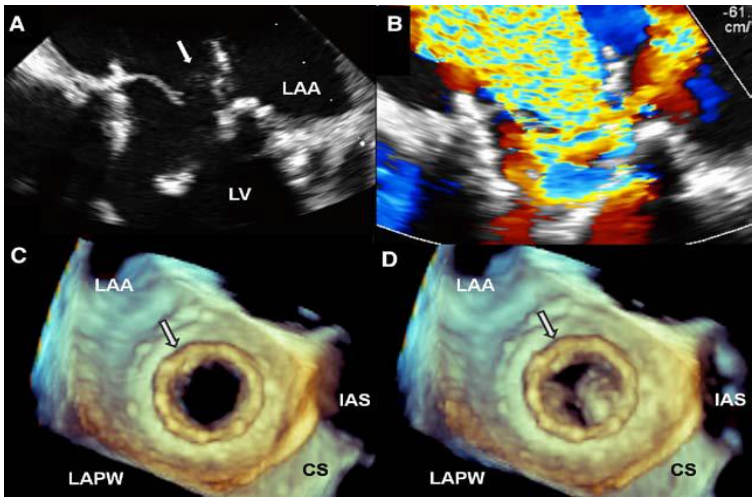
Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Planning the procedure: Sizing

- Distortion may be due to the shape of the surgical valve (Zegdi 2008)



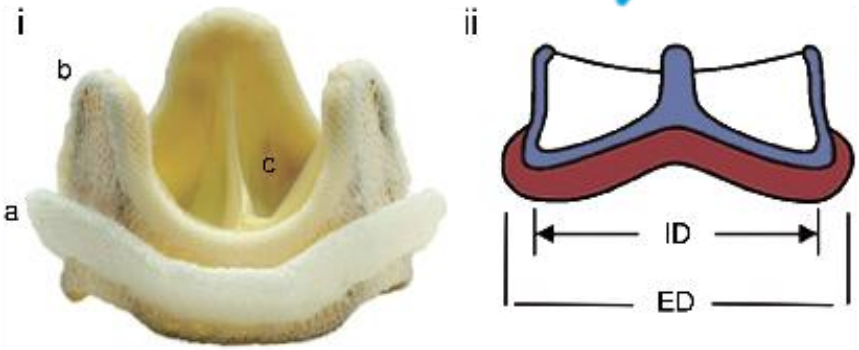
- Poor function and early failure may be due to distortion (Olmos 2013)

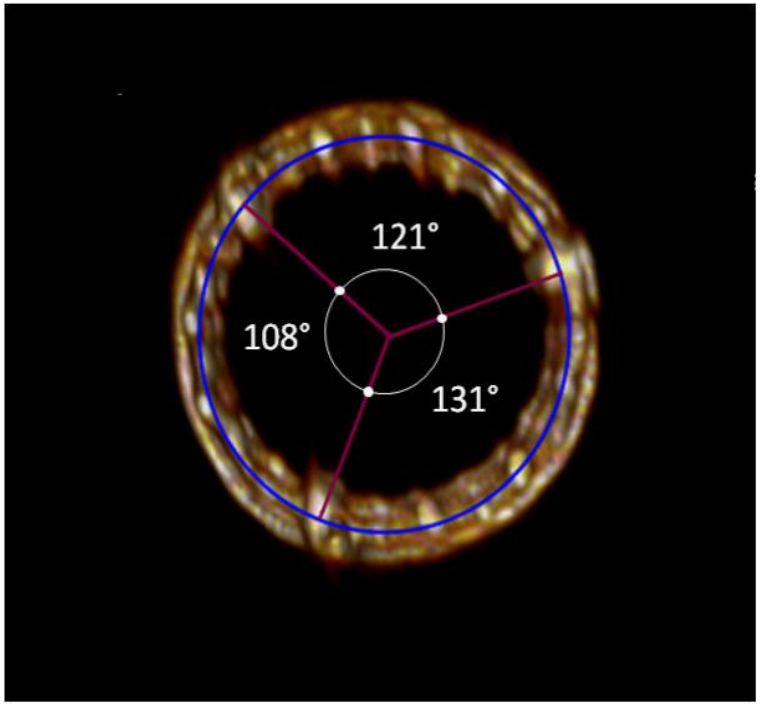


Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Sizing – CT scan

- Same nominal size ≠ Same CSA at CT
  - Native Annulus
- Surgical Valves are not always simmetrical
  - Surgical Implantation Technique
- Valve tissue, Pannus, Calcium





Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Redo MVS: The MIS Approach

- Right or left thoracotomy
- Avoid dissection
  - CABG
  - Innominate vein
- Fem-Fem CPB
- Perfusion and VF

The VIVID Registry

Surgical Mitral Bioprosthesis (n=157)

Type	
Edwards Perimount	52.9%
Medtronic Mosaic	17.8%
Medtronic Hancock	9.6%
St Jude Epic	3.8%
Other	15.9%

Label Size	
23mm	1.3%
25 mm	10.8%
26mm	1.3%
27mm	43.3%
28mm	1.3%
29mm	27.4%
31mm	11.5%
33mm	0.6%
Unknown	6%

Valve-in-Valve International Data VIVID

*Dvir D, AATS Meeting, 2014

The VIVID Registry

Surgical Mitral Ring (n=33)

Type		Label Size	
Edwards Physio	69.7%	26mm	18.1%
Duran	12.1%	28 mm	42.4%
St Jude Seguin	9.1%	30mm	1.3%
Other	9.1%	32mm	9.1%
		other	21.2%

Valve-in-Valve International Data VIVID

*Dvir D, AATS Meeting, 2014

Mitral Valve in valve implantation In Massa

- Mean DP 6.6±2.2 mmHg (range 4-11 mmHg)
- The DP rose to > 10 mmHg in 2 patients
  - 26 mm Sapien in 25 mm Edwards Magna
    - from 8 mmHg to 10 mmHg
  - 29 mm Sapien in 29 mm Edwards Magna
    - From 5 mmHg to 11 mmHg
- Significant oversizing (149% for both) compared with the measured CSA of the surgical valve

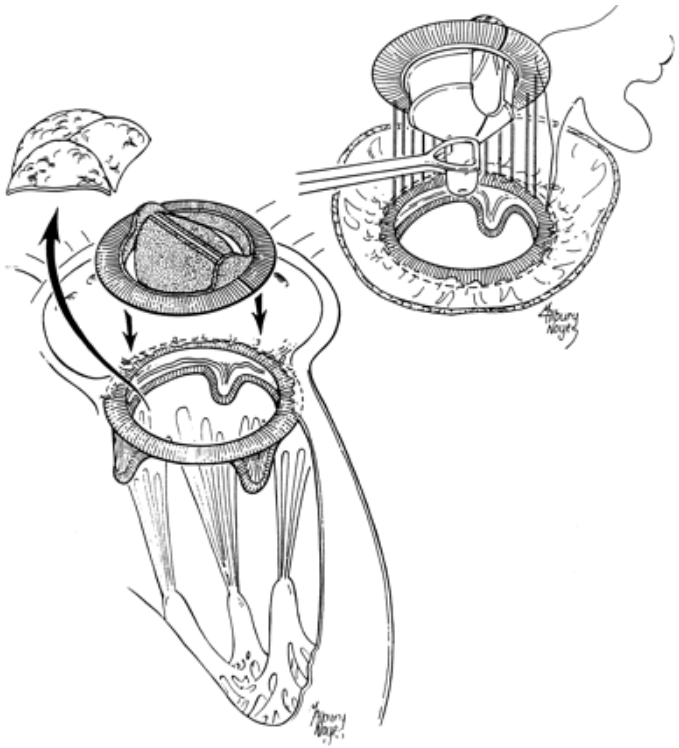
The "Valve On Valve"

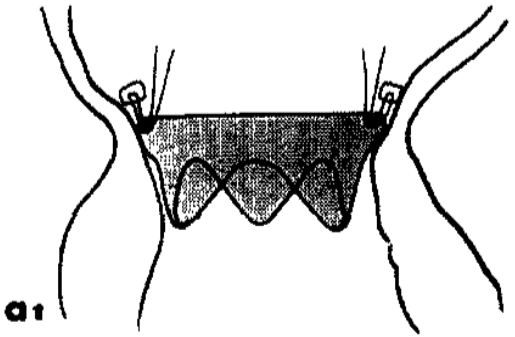
Bioprosthesis replacement with mechanical valve implantation on the bioprosthetic ring

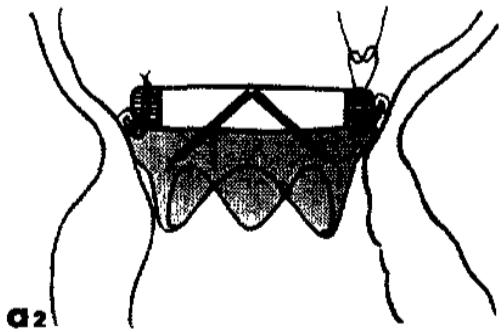
Surgical and 2D echo considerations

P. Stassano*, M. A. Losi, A. Golino, C. Gagliardi, D. Iorio, M. Marzullo, N. Spampinato

Department of Cardiac Surgery, 2nd Medical School, University of Naples, via S. Pansini, 5, I-80131 Naples, Italy

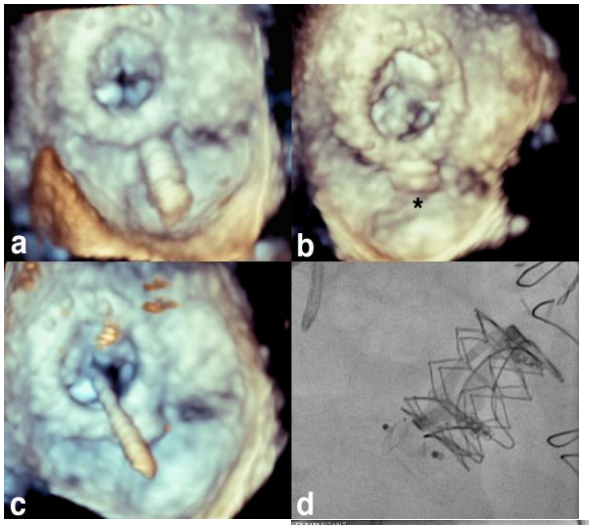


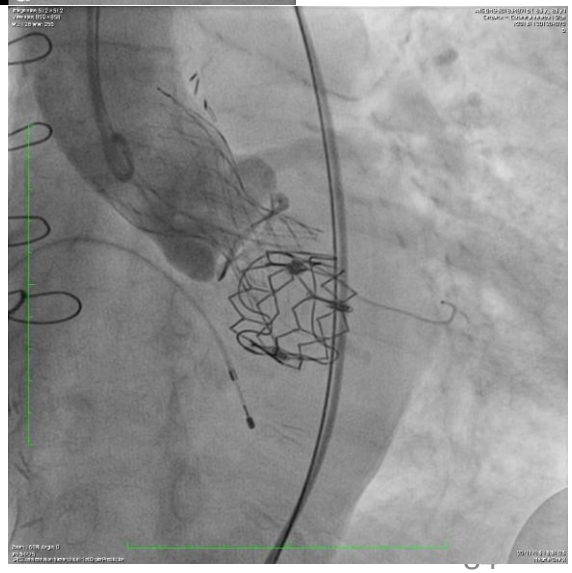




Mitral Valve in valve implantation In Massa

- Two patients underwent concomitant PV leak occlusion
- Two patient also underwent TAVI





The issue of postprocedural gradient

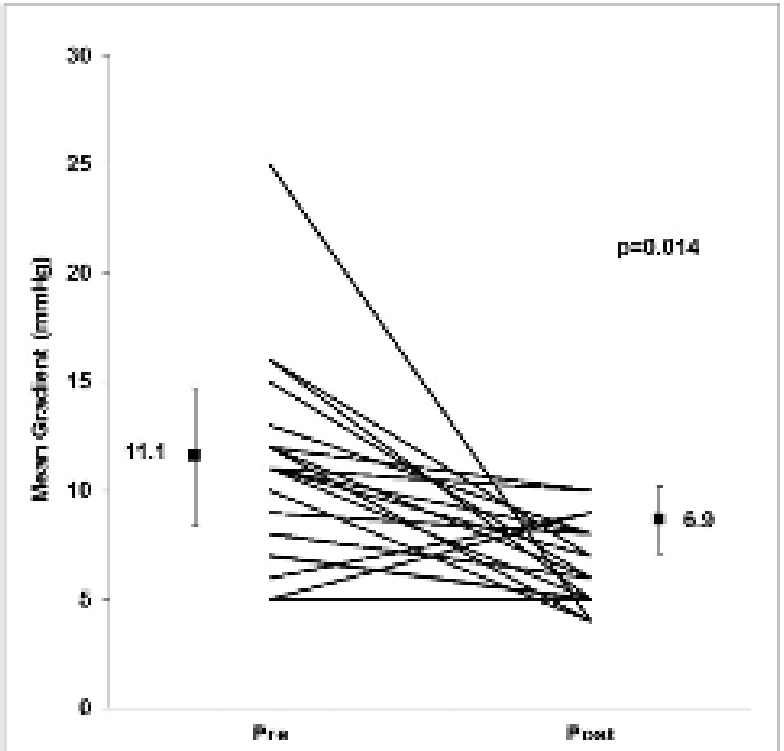
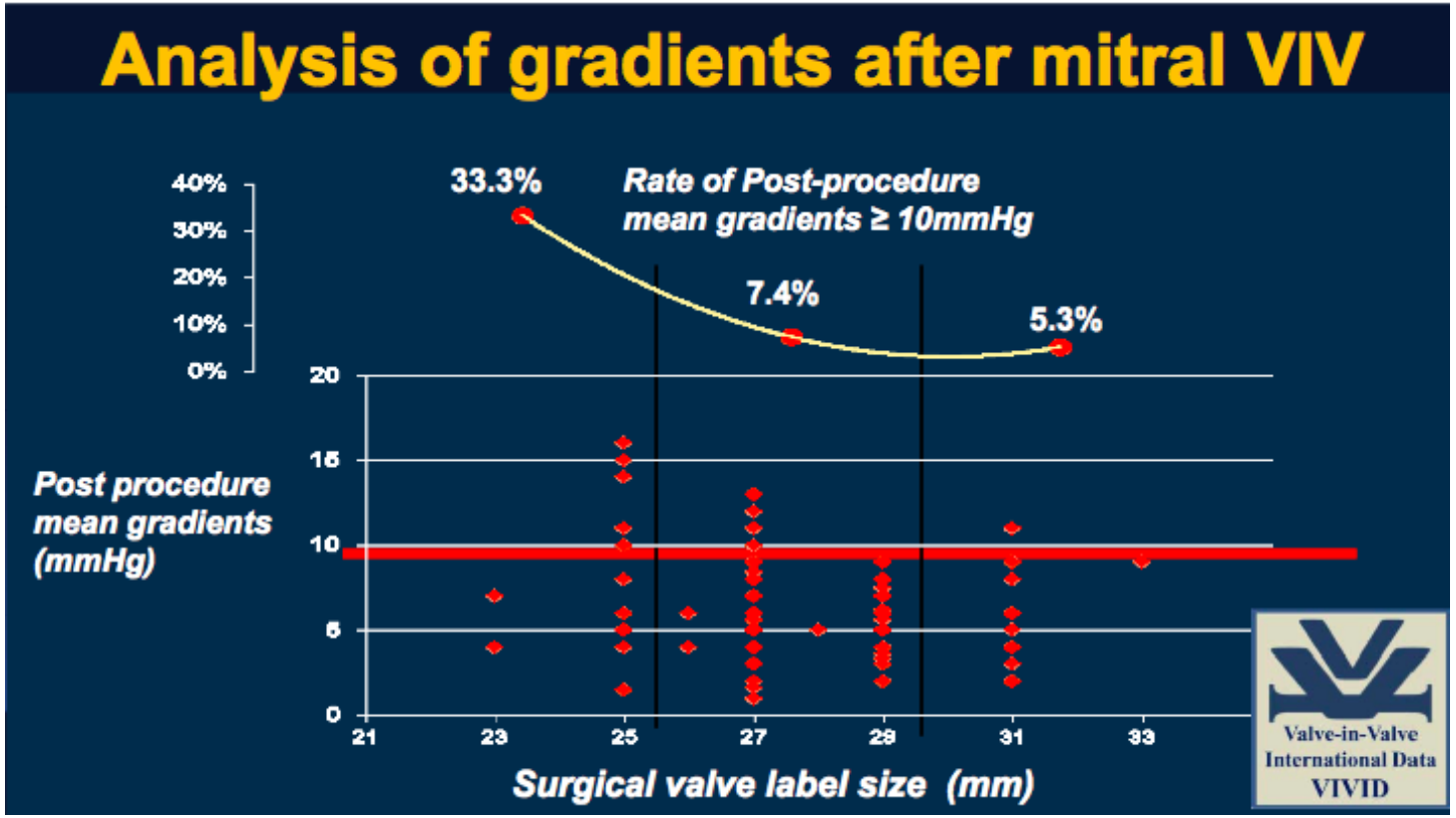


Figure 5 Transvalvular Gradient

Transvalvular gradient pre- and post-transcatheter mitral valve-in-valve implantation.

Cheung A, 2013

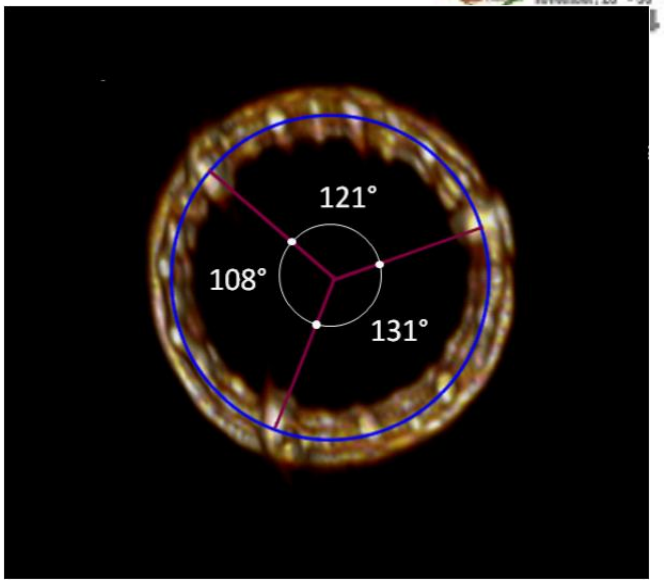
The VIVID Registry

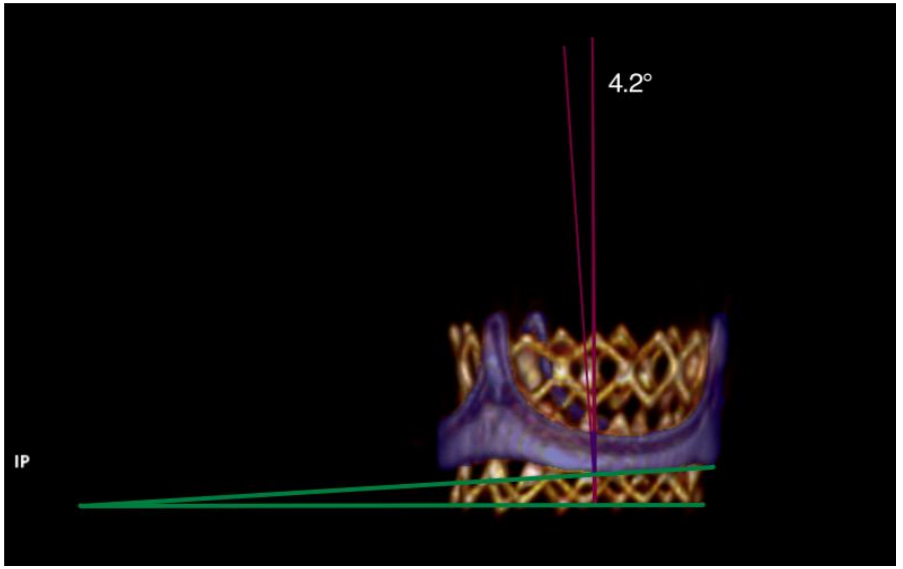


*Dvir D, AATS Meeting, 2014

Follow-up

- Control CT scan : 12 patients
  - Hourglass : 5
  - Truncated Cone : 5
  - Asymmetric/flattened side : 2
- Never coaxial !





Comment

- A Transprosthetic gradient in the « Moderate to severe MS range » is not uncommon
  - Cheung 2013 : 4/23 patients at discharge
  - Seiffert 2012 : 1/7
  - Wilbring 2013 : 1/11
  - Present series : 2/15

- No correlates on the clinical ground to date but...

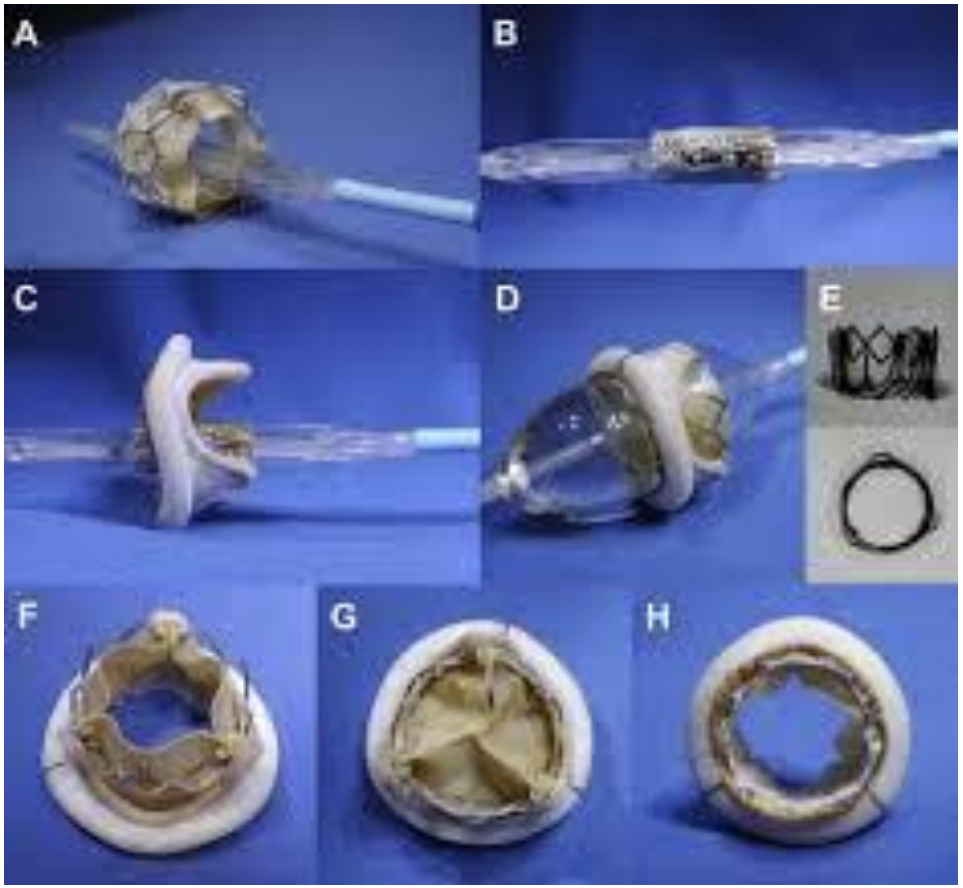
Conclusion

- Transcatheter Mitral Valve in Valve implantation is an excellent alternative to conventional surgery
- Optimal planning is crucial
  - Sizing
  - Height of implantation
  - Orientation of the THV
- 3D imaging might help to understand the mechanisms leading to high gradients and eventually to early failure

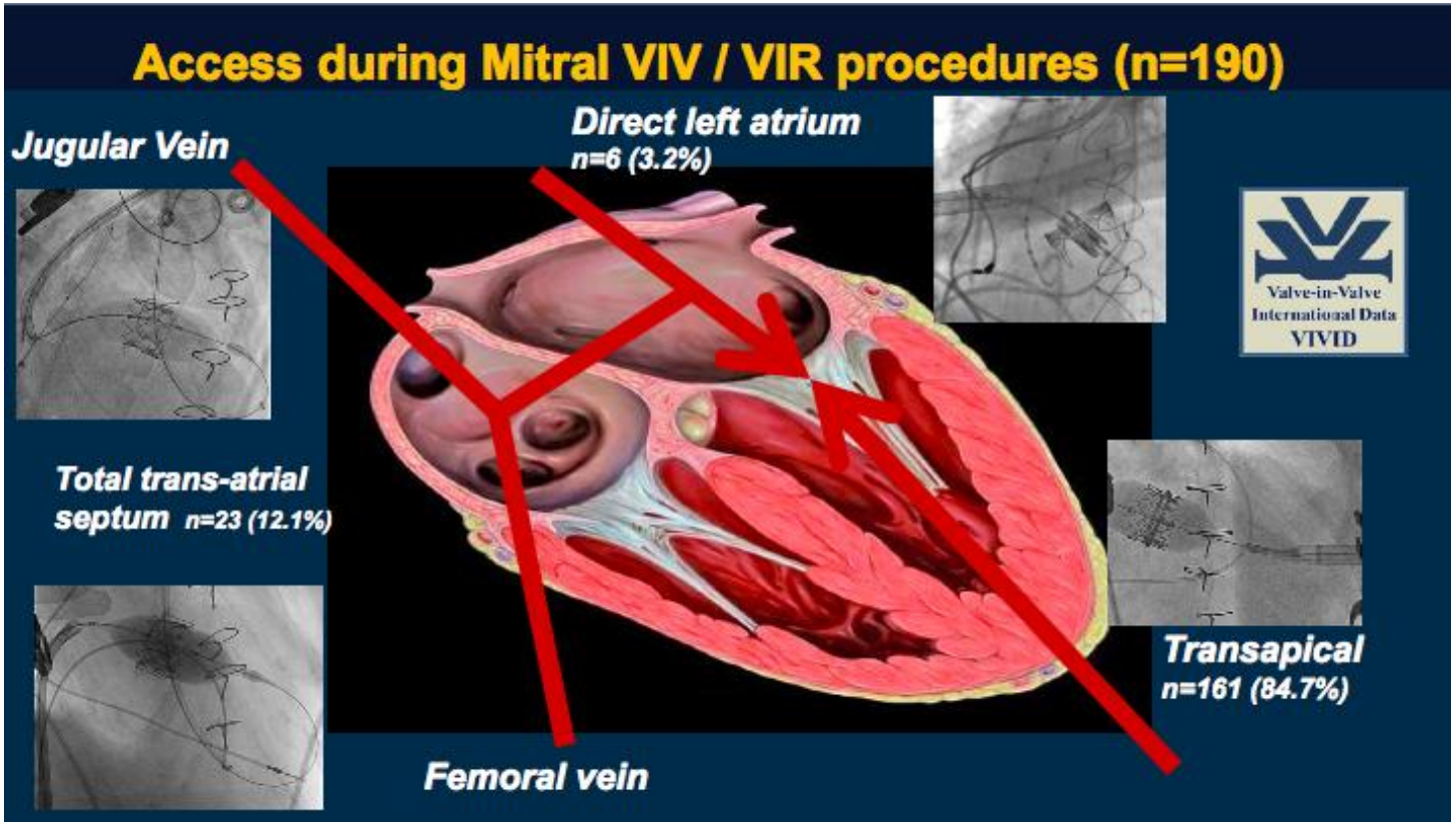
Thanks

Mitral VIV: When?

- Clinical use of VIV
  - Feasible
  - Safe
  - Effective

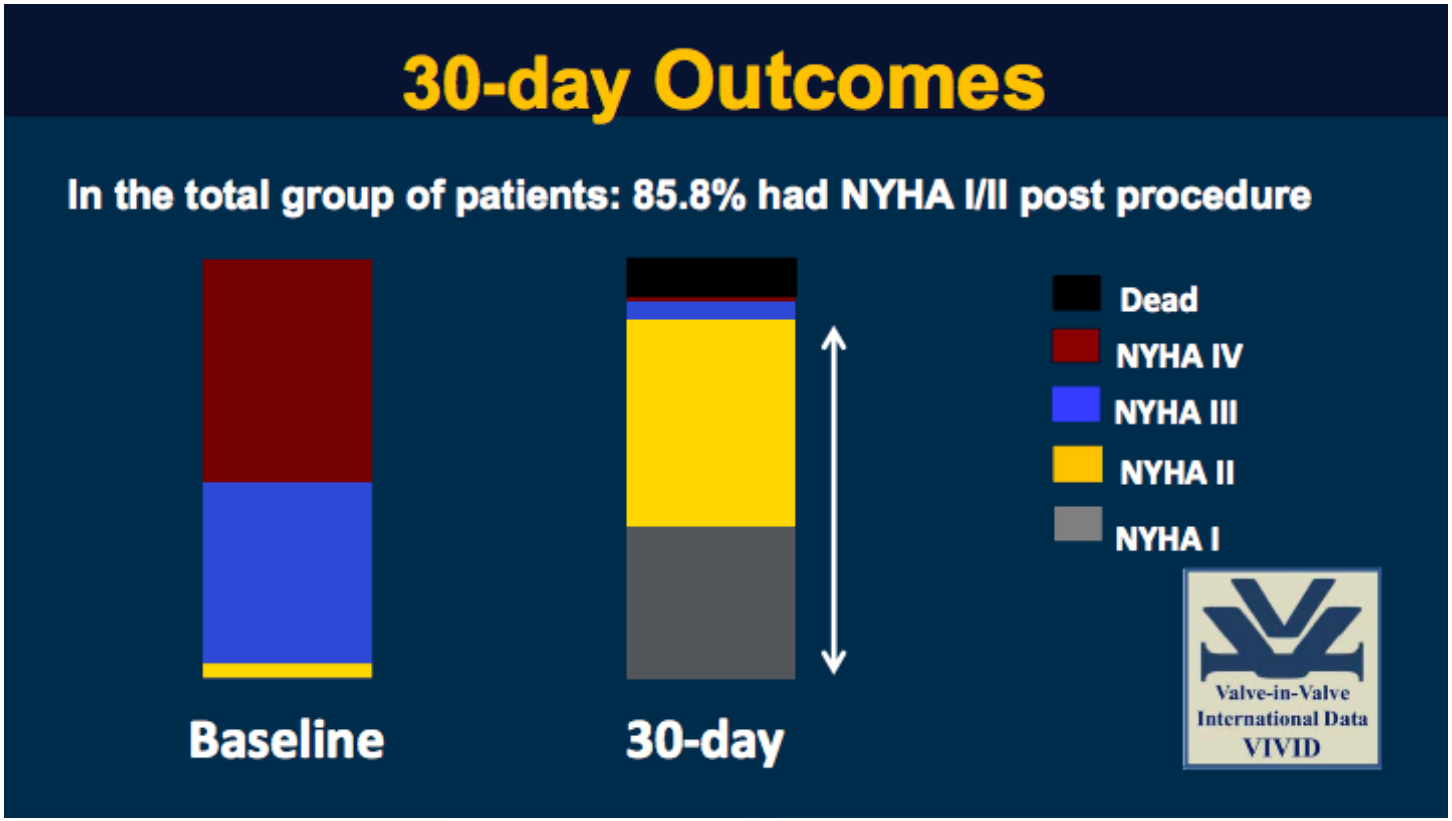


The VIVID Registry



*Dvir D, AATS Meeting, 2014

The VIVID Registry



*Dvir D, AATS Meeting, 2014

The VIVID Registry

Post Procedure Echocardiography

Mitral VIV / VIR Procedures (n=190)

MV area (cm^2)	2.1 ± 0.7
MV max gradients (mmHg)	12.7 ± 5.7
MV mean gradients (mmHg)	6.2 ± 2.7
MR (≥2)	4.2%
LVEF (%)	51.8 ± 12.9
LVOT mean gradient ≥20mmHg	2.1%

Valve-in-Valve International Data VIVID

*Dvir D, AATS Meeting, 2014

Valvular Heart Disease

Transcatheter Valve-in-Valve Implantation for Failed Bioprosthetic Heart Valves

John G. Webb, MD; David A. Wood, MD; Jian Ye, MD; Ronen Gurvitch, MD; Jean-Bernard Masson, MD; Josep Rodés-Cabau, MD; Mark Osten, MD; Eric Horlick, MD; O. Wendler, MD; Eric Dumont, MD; Ronald G. Carere, MD; Namal Wijesinghe, MD; Fabian Nietlispach, MD; Mark Johnson, MD; Chrisopher R. Thompson, MD; Robert Moss, MD; Jonathon Leipsic, MD; Brad Munt, MD; Samuel V. Lichtenstein, MD, PhD; Anson Cheung, MD

Background—The majority of prosthetic heart valves currently implanted are tissue valves that can be expected to degenerate with time and eventually fail. Repeat cardiac surgery to replace these valves is associated with significant morbidity and mortality. Transcatheter heart valve implantation within a failed bioprosthesis, a "valve-in-valve" procedure, may offer a less invasive alternative.

Methods and Results—Valve-in-valve implantations were performed in 24 high-risk patients. Failed valves were aortic (n=10), mitral (n=7), pulmonary (n=6), or tricuspid (n=1) bioprostheses. Implantation was successful with immediate restoration of satisfactory valve function in all but 1 patient. No patient had more than mild regurgitation after implantation. No patients died during the procedure. Thirty-day mortality was 4.2%. Mortality was related primarily to learning-curve issues early in this high-risk experience. At baseline, 88% of patients were in New York Heart Association functional class III or IV; at the last follow-up, 88% of patients were in class I or II. At a median follow-up of 135 days (interquartile range, 46 to 254 days) and a maximum follow-up of 1045 days, 91.7% of patients remained alive with satisfactory valve function.

Conclusions—Transcatheter valve-in-valve implantation is a reproducible option for the management of bioprosthetic valve failure. Aortic, pulmonary, mitral, and tricuspid tissue valves were amenable to this approach. This finding may have important implications with regard to valve replacement in high-risk patients. (***Circulation***. **2010;121:1848-1857.**)

Key Words: catheter ■ mitral valve ■ surgery ■ heart valves

Valvular Heart Disease

Transcatheter Valve-in-Valve Implantation for Failed Bioprosthetic Heart Valves

John G. Webb, MD; David A. Wood, MD; Jian Ye, MD; Ronen Gurvitch, MD; Jean-Bernard Masson, MD; Josep Rodés-Cabau, MD; Mark Osten, MD; Eric Horlick, MD; O. Wendler, MD; Eric Dumont, MD; Ronald G. Carere, MD; Namal Wijesinghe, MD; Fabian Nietlispach, MD; Mark Johnson, MD; Chrisopher R. Thompson, MD; Robert Moss, MD; Jonathon Leipsic, MD; Brad Munt, MD; Samuel V. Lichtenstein, MD, PhD; Anson Cheung, MD

Background—The majority of prosthetic heart valves currently implanted are tissue valves that can be expected to degenerate with time and eventually fail. Repeat cardiac surgery to replace these valves is associated with significant morbidity and mortality. Transcatheter heart valve implantation within a failed bioprosthesis, a "valve-in-valve" procedure, may offer a less invasive alternative.

Methods and Results—Valve-in-valve implantations were performed in 24 high-risk patients. Failed valves were aortic (n=10), mitral (n=7), pulmonary (n=6), or tricuspid (n=1) bioprostheses. Implantation was successful with immediate restoration of satisfactory valve function in all but 1 patient. No patient had more than mild regurgitation after implantation. No patients died during the procedure. Thirty-day mortality was 4.2%. Mortality was related primarily to learning-curve issues early in this high-risk experience. At baseline, 88% of patients were in New York Heart Association functional class III or IV; at the last follow-up, 88% of patients were in class I or II. At a median follow-up of 135 days (interquartile range, 46 to 254 days) and a maximum follow-up of 1045 days, 91.7% of patients remained alive with satisfactory valve function.

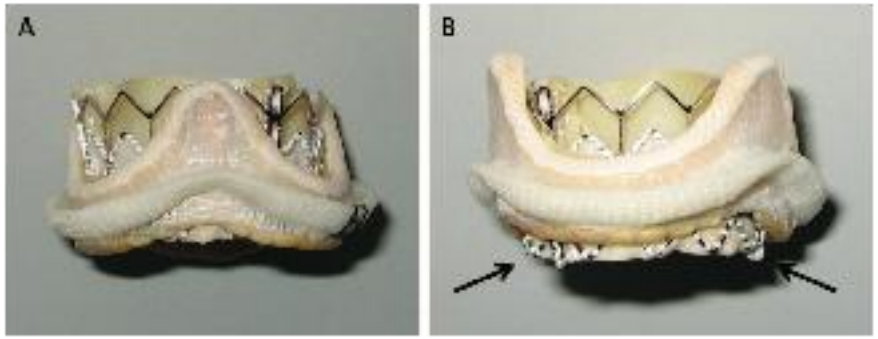
Conclusions—Transcatheter valve-in-valve implantation is a reproducible option for the management of bioprosthetic valve failure. Aortic, pulmonary, mitral, and tricuspid tissue valves were amenable to this approach. This finding may have important implications with regard to valve replacement in high-risk patients. (***Circulation***. **2010;121:1848-1857.**)

Key Words: catheter ■ mitral valve ■ surgery ■ heart valves

Mitral Procedure

A first-in-human attempt using a percutaneous transseptal approach was unsuccessful (Figure 5). Noncoaxial and too ventricular positioning of the THV within the surgically implanted prosthesis resulted in embolization. The THV was maintained on the guidewire within the left ventricle, facilitating emergent conversion to conventional surgery. The procedure was prolonged, and the patient died of multisystem failure the next day. In the second patient, an open transatrial approach was attempted.[5] Stable cannulation and coaxial positioning within the mitral prosthesis could not be accomplished, and the procedure was converted to a transapical approach. Although the THV was successfully implanted, the procedure was prolonged and entailed bilateral thoracotomy. The patient died on day 45.

After this discouraging initial experience with the transseptal and transatrial approaches, subsequent procedures were performed with transapical access. All 5 subsequent mitral implantations were successfully and relatively easily accomplished, and all patients were alive at the 30-day follow-up (Table 3) and remained alive at a median follow-up of 72



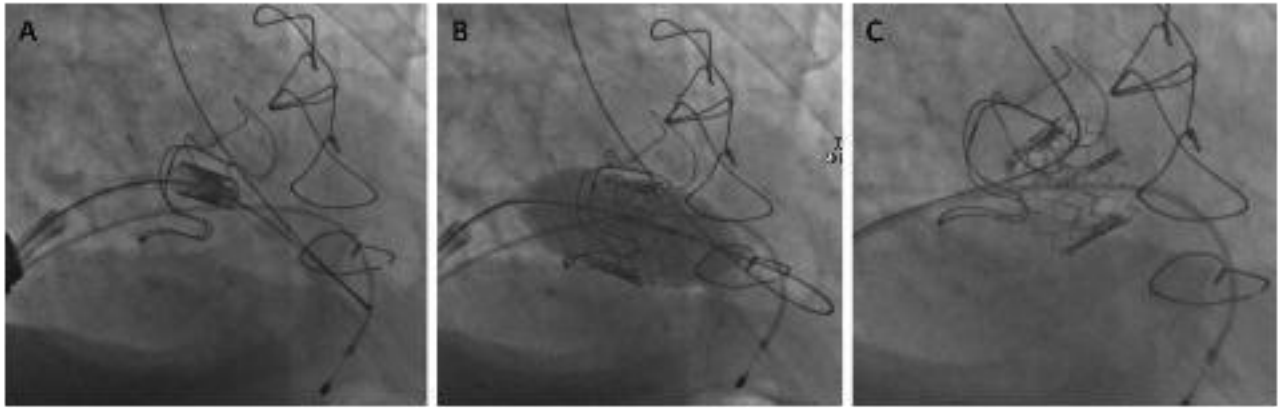
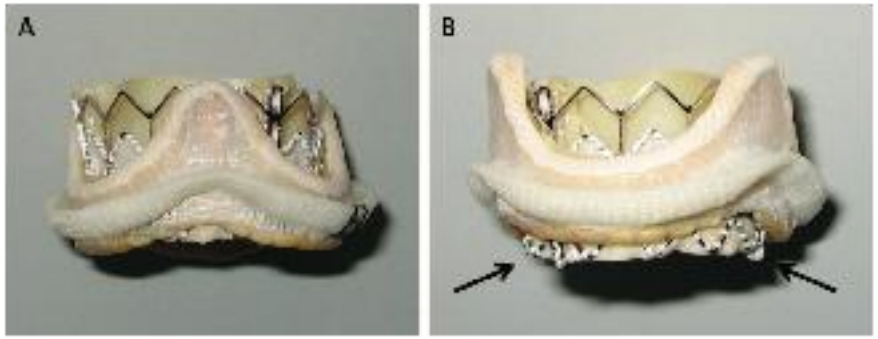


Figure 5. First-in-human attempted mitral valve-in-valve procedure. A, Through the use of a transvenous, transseptal approach, a balloon-expandable THV has been positioned within a degenerated mitral bioprosthesis. The radiolucent sewing ring is not visible and is not overlapped by the THV. B, The balloon is inflated, splaying the struts of the prosthesis and resulting in ejection of the THV. C, The THV was maintained in a stable position by the coaxial guidewire. The patient (patient 1) underwent conventional surgery.

Mitral Procedure

A first-in-human attempt using a percutaneous transseptal approach was unsuccessful (Figure 5). Noncoaxial and too ventricular positioning of the THV within the surgically implanted prosthesis resulted in embolization. The THV was maintained on the guidewire within the left ventricle, facilitating emergent conversion to conventional surgery. The procedure was prolonged, and the patient died of multisystem failure the next day. In the second patient, an open transatrial approach was attempted.[5] Stable cannulation and coaxial positioning within the mitral prosthesis could not be accomplished, and the procedure was converted to a transapical approach. Although the THV was successfully implanted, the procedure was prolonged and entailed bilateral thoracotomy. The patient died on day 45.

After this discouraging initial experience with the transseptal and transatrial approaches, subsequent procedures were performed with transapical access. All 5 subsequent mitral implantations were successfully and relatively easily accomplished, and all patients were alive at the 30-day follow-up (Table 3) and remained alive at a median follow-up of 72



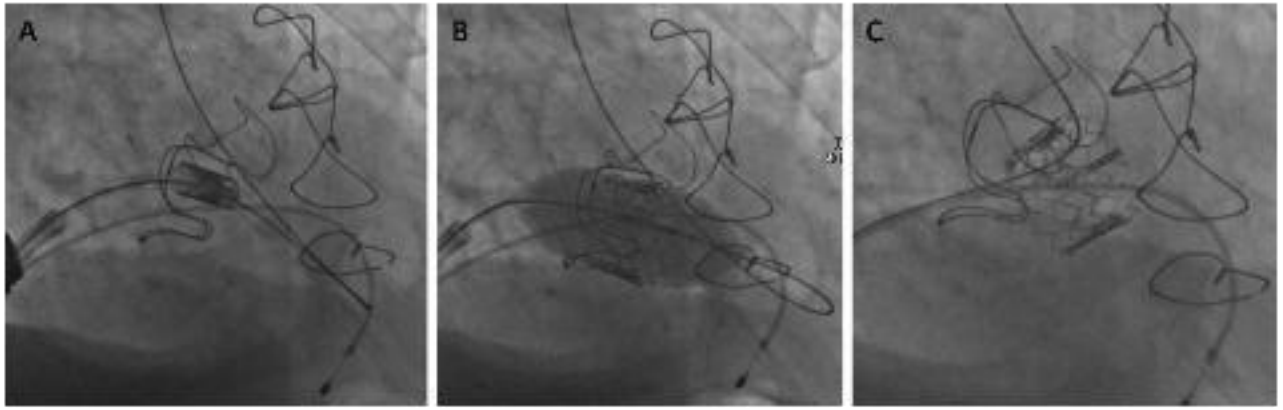


Figure 5. First-in-human attempted mitral valve-in-valve procedure. A, Through the use of a transvenous, transseptal approach, a balloon-expandable THV has been positioned within a degenerated mitral bioprosthesis. The radiolucent sewing ring is not visible and is not overlapped by the THV. B, The balloon is inflated, splaying the struts of the prosthesis and resulting in ejection of the THV. C, The THV was maintained in a stable position by the coaxial guidewire. The patient (patient 1) underwent conventional surgery.

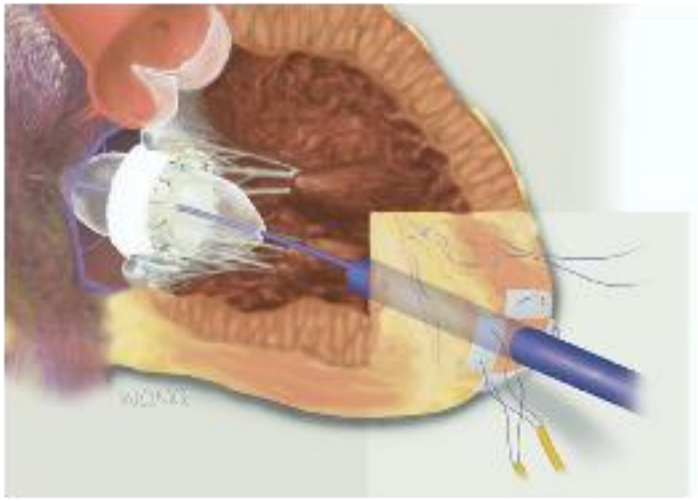
Transapical Transcatheter Mitral Valve-in-Valve Implantation in a Human

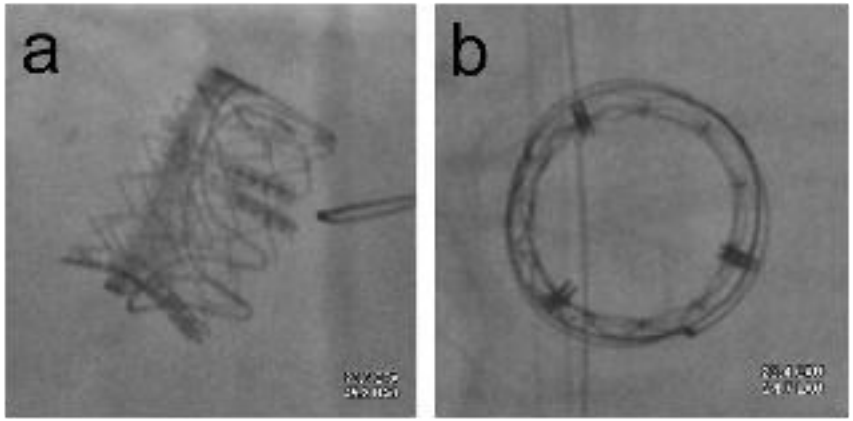
Anson Cheung, MD, John G. Webb, MD, Daniel R. Wong, MD, MPH, Jian Ye, MD, Jean-Bernard Masson, MD, Ronald G. Carere, MD, and Samuel V. Lichtenstein, MD, PhD

Divisions of Cardiac Surgery and Cardiology, St. Paul's Hospital, University of British Columbia, Vancouver, Canada

We describe a human transcatheter transapical mitral valve implant within a mitral bioprosthesis (valve-in-valve). A high-risk, 80-year-old man with symptomatic bioprosthetic mitral stenosis was positioned for anterior minithoracotomy. Left ventricular apical access was obtained. After balloon valvuloplasty, a cuffed, 26-mm Cribier-Edwards transcatheter valve (Edwards Lifesciences LLC, Irvine, CA) was deployed within the mitral xenograft, using rapid ventricular pacing. The transcatheter valve functioned properly postoperatively; however, the patient died of multiple organ dysfunction.

(Ann Thorac Surg 2009;87:e18–20)





Concerned about difficulty crossing the stenotic bioprosthesis retrogradely and entanglement within the preserved chords, we first attempted an antegrade approach through the left atrium, using a right anterior minithoracotomy, but were unable to cross the xenograft. This approach was abandoned.

A left anterior minithoracotomy through the sixth intercostal space was centered over the left ventricular (LV) apex. Two pledgetted sutures were placed apically for control. The mitral valve was easily crossed, and the wire was advanced into the pulmonary veins for anchoring. This approach provided a direct shot from apex to valve (Fig 1a).

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

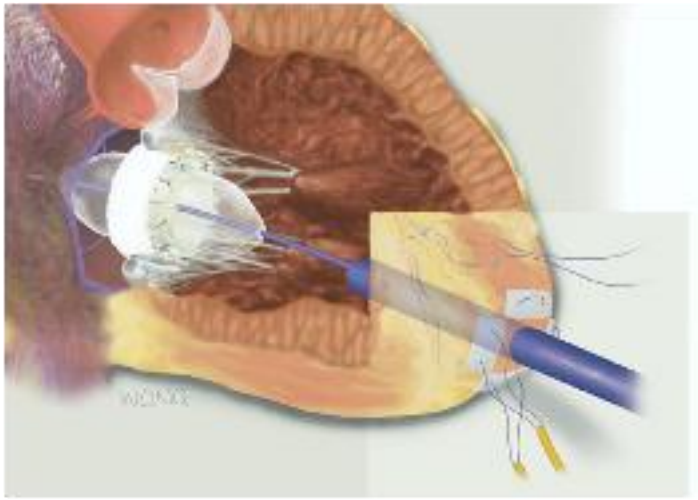
Transapical Transcatheter Mitral Valve-in-Valve Implantation in a Human

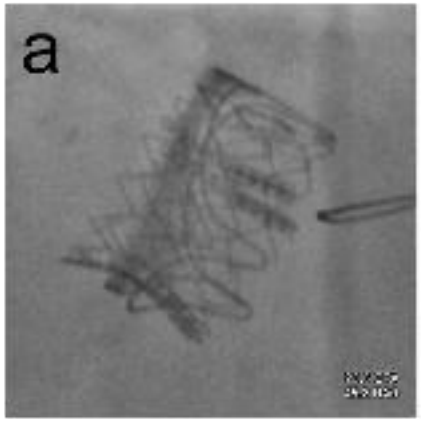
Anson Cheung, MD, John G. Webb, MD, Daniel R. Wong, MD, MPH, Jian Ye, MD, Jean-Bernard Masson, MD, Ronald G. Carere, MD, and Samuel V. Lichtenstein, MD, PhD

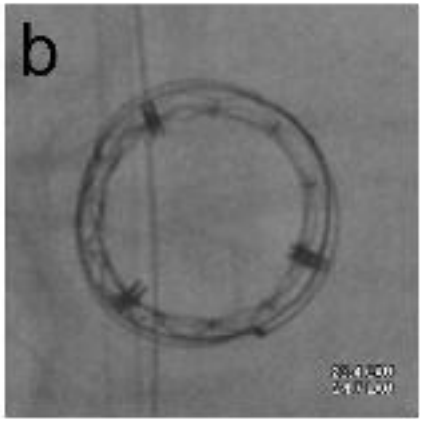
Divisions of Cardiac Surgery and Cardiology, St. Paul's Hospital, University of British Columbia, Vancouver, Canada

We describe a human transcatheter transapical mitral valve implant within a mitral bioprosthesis (valve-in-valve). A high-risk, 80-year-old man with symptomatic bioprosthetic mitral stenosis was positioned for anterior minithoracotomy. Left ventricular apical access was obtained. After balloon valvuloplasty, a cuffed, 26-mm Cribier-Edwards transcatheter valve (Edwards Lifesciences LLC, Irvine, CA) was deployed within the mitral xenograft, using rapid ventricular pacing. The transcatheter valve functioned properly postoperatively; however, the patient died of multiple organ dysfunction.

(Ann Thorac Surg 2009;87:e18–20)







Concerned about difficulty crossing the stenotic bioprosthesis retrogradely and entanglement within the preserved chords, we first attempted an antegrade approach through the left atrium, using a right anterior minithoracotomy, but were unable to cross the xenograft. This approach was abandoned.

A left anterior minithoracotomy through the sixth intercostal space was centered over the left ventricular (LV) apex. Two pledgetted sutures were placed apically for control. The mitral valve was easily crossed, and the wire was advanced into the pulmonary veins for anchoring. This approach provided a direct shot from apex to valve (Fig 1a).

Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Transcatheter Mitral Valve-in-Valve Implantation in Patients With Degenerated Bioprostheses

Moritz Seiffert, MD,* Lenard Conradi, MD,* Stephan Baldus, MD,†
Johannes Schirmer, MD,* Malgorzata Knap, MD,† Stefan Blankenberg, MD,†
Hermann Reichenspurner, MD, PHD,* Hendrik Treede, MD*

Hamburg, Germany

Objectives This study reports the results of a series of transapical mitral valve-in-valve implantations and aims to offer guidance on technical aspects of the procedure.

Background Mitral valve reoperations due to failing bioprostheses are associated with high morbidity and mortality. Transcatheter techniques may evolve as complementary approaches to surgery in these high-risk patients.

Methods Six patients (age 75 ± 15 years) received transapical implantation of a balloon-expandable pericardial heart valve into a degenerated bioprosthesis (range 27 to 31 mm) in mitral position at our institution. All patients were considered high risk for surgical valve replacement (logistic EuroSCORE: 33 ± 15%) after evaluation by an interdisciplinary heart team. Procedural and clinical outcomes were analyzed.

Results Implantation was successful in all patients with reduction of mean transvalvular gradients from 11.3 ± 5.2 mm Hg to 5.5 ± 3.6 mm Hg ($p = 0.016$) and median regurgitation from grade 3.0 (interquartile range [IQR]: 2.7 to 3.1) to 0 (IQR: 0 to 1.0, $p = 0.033$) with trace paravalvular regurgitation remaining in 2 patients. Apical bleeding occurred in 2 patients requiring rethoracotomy in 1 and resuscitation in a second patient, the latter of whom died on postoperative day 6. In the remaining patients, median New York Heart Association functional class improved from 3.0 (IQR: 3.0 to 3.5) to 2.0 (IQR: 1.5 to 2.0, $p = 0.048$) over a median follow-up of 70 (IQR: 25.5 to 358) days.

Conclusions With acceptable results in a high-risk population, transapical mitral valve-in-valve implantation can be considered as a complementary approach to reoperative mitral valve surgery in select patients. (J Am Coll Cardiol Intv 2012;5:341–9) © 2012 by the American College of Cardiology Foundation

Transcatheter Mitral Valve-in-Valve Implantation in Patients With Degenerated Bioprostheses

Moritz Seiffert, MD,* Lenard Conradi, MD,* Stephan Baldus, MD,†
Johannes Schirmer, MD,* Malgorzata Knap, MD,† Stefan Blankenberg, MD,†
Hermann Reichenspurner, MD, PHD,* Hendrik Treede, MD*

Hamburg, Germany

Objectives This study reports the results of a series of transapical mitral valve-in-valve implantations and aims to offer guidance on technical aspects of the procedure.

Background Mitral valve reoperations due to failing bioprostheses are associated with high morbidity and mortality. Transcatheter techniques may evolve as complementary approaches to surgery in these high-risk patients.

Methods Six patients (age 75 ± 15 years) received transapical implantation of a balloon-expandable pericardial heart valve into a degenerated bioprosthesis (range 27 to 31 mm) in mitral position at our institution. All patients were considered high risk for surgical valve replacement (logistic EuroSCORE: 33 ± 15%) after evaluation by an interdisciplinary heart team. Procedural and clinical outcomes were analyzed.

Results Implantation was successful in all patients with reduction of mean transvalvular gradients from 11.3 ± 5.2 mm Hg to 5.5 ± 3.6 mm Hg ($p = 0.016$) and median regurgitation from grade 3.0 (interquartile range [IQR]: 2.7 to 3.1) to 0 (IQR: 0 to 1.0, $p = 0.033$) with trace paravalvular regurgitation remaining in 2 patients. Apical bleeding occurred in 2 patients requiring rethoracotomy in 1 and resuscitation in a second patient, the latter of whom died on postoperative day 6. In the remaining patients, median New York Heart Association functional class improved from 3.0 (IQR: 3.0 to 3.5) to 2.0 (IQR: 1.5 to 2.0, $p = 0.048$) over a median follow-up of 70 (IQR: 25.5 to 358) days.

Conclusions With acceptable results in a high-risk population, transapical mitral valve-in-valve implantation can be considered as a complementary approach to reoperative mitral valve surgery in select patients. (J Am Coll Cardiol Intv 2012;5:341–9) © 2012 by the American College of Cardiology Foundation

Transcatheter Valve in Valve Implantation for Failed Mitral and Tricuspid Bioprosthesis

Alfredo Giuseppe Cerillo,[1*] MD, Francesca Chiaramonti,[1] MD, Michele Murzi,[1] MD, Stefano Bevilacqua,[1] MD, Elisa Cerone,[2] MD, Cataldo Palmieri,[2] MD, Paolo Del Sarto,[3] MD, Massimiliano Mariani,[2] MD, Sergio Berti,[2] MD, and Mattia Glauber,[1] MD

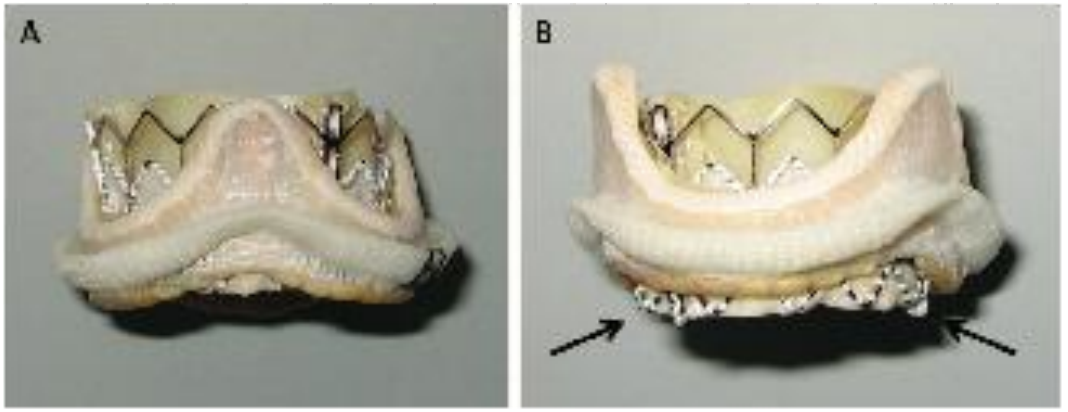
Objective: We report our experience with the transapical transcatheter "Valve in valve" implantation (T-VIV) in patients with a failed mitral or tricuspid bioprosthesis; we briefly review the pertinent literature, and discuss some technical aspects of this procedure. Background: Redo valve surgery for failure of a mitral or tricuspid bioprosthesis might become extremely challenging, both because of the patients' condition, which is frequently poor, and for the technical aspects of the operation itself, that can be very demanding. T-VIV has been widely employed with good results for the treatment of aortic bioprosthesis failure, and could represent an attractive option in this setting. Methods: Four patients with multiple comorbidities (age: 63-83 years; logistic Euroscore: 37.2-81.5) underwent T-VIV at our institution for failure of a mitral [3] or tricuspid [1] bioprosthesis. A 26mm Sapien valve was used in all cases. All the mitral procedures were performed via a transapical approach. The tricuspid procedure was performed via a transjugular approach. Results: The first mitral procedure was complicated by the splaying of the xenograft stents and embolization of the valve. The procedure was converted to conventional surgery, and the patient died on postoperative day 1. In the subsequent procedures, the valve was positioned more atrially, and was fixed to the malfunctioning xenograft sewing ring. All subsequent procedures were successful, all patients were discharged home and were alive and well at follow-up. Conclusions: The results of T-VIV procedure in the mitral position have been suboptimal, and four of the sixteen patients reported to date died. However, all patients were extremely diseased, and some of the reported failures were related to amendable technical factors relative to the surgical access or to the valve deployment technique. With increasing experience, this procedure might become indicated as an alternative to conventional surgery in selected patients, encouraging increased use of bioprosthesis, and marking a pivotal change in the management of valvular disease.

Key words: TAVI; Redo valve surgery; bioprosthesis failure

Transcatheter Valve in Valve Implantation for Failed Mitral and Tricuspid Bioprosthesis

Alfredo Giuseppe Cerillo,[1*] MD, Francesca Chiaramonti,[1] MD, Michele Murzi,[1] MD, Stefano Bevilacqua,[1] MD, Elisa Cerone,[2] MD, Cataldo Palmieri,[2] MD, Paolo Del Sarto,[3] MD, Massimiliano Mariani,[2] MD, Sergio Berti,[2] MD, and Mattia Glauber,[1] MD

Objective: We report our experience with the transapical transcatheter "Valve in valve" implantation (T-VIV) in patients with a failed mitral or tricuspid bioprosthesis; we briefly review the pertinent literature, and discuss some technical aspects of this procedure. Background: Redo valve surgery for failure of a mitral or tricuspid bioprosthesis might become extremely challenging, both because of the patients' condition, which is frequently poor, and for the technical aspects of the operation itself, that can be very demanding. T-VIV has been widely employed with good results for the treatment of aortic bioprosthesis failure, and could represent an attractive option in this setting. Methods: Four patients with multiple comorbidities (age: 63-83 years; logistic Euroscore: 37.2-81.5) underwent T-VIV at our institution for failure of a mitral [3] or tricuspid [1] bioprosthesis. A 26mm Sapien valve was used in all cases. All the mitral procedures were performed via a transapical approach. The tricuspid procedure was performed via a transjugular approach. Results: The first mitral procedure was complicated by the splaying of the xenograft stents and embolization of the valve. The procedure was converted to conventional surgery, and the patient died on postoperative day 1. In the subsequent procedures, the valve was positioned



Fondazione Toscana Gabriele Monasterio
PER LA RICERCA MEDICA E DI SANITÀ PUBBLICA

Fig. 3. A: Left ventriculography demonstrating a giant pseudoaneurysm originating from the apical wound (patient 2). The arrow indicates the site of the apical wound. B: Multiplanar reformation (MPR) image of the same patient, demonstrating the pseudoaneurysm (*).

The VIVID Registry

- Suboptimal results during the initial experience
- Learning curve: short but steep
- Not all the approaches yelded the same results!