EcoCardioChirurgia®
Eco-RM-TC
Chirurgia-Interventistica

IX CONGRESSO NAZIONALE
ECOCARDIOCHIRURGIA 2017

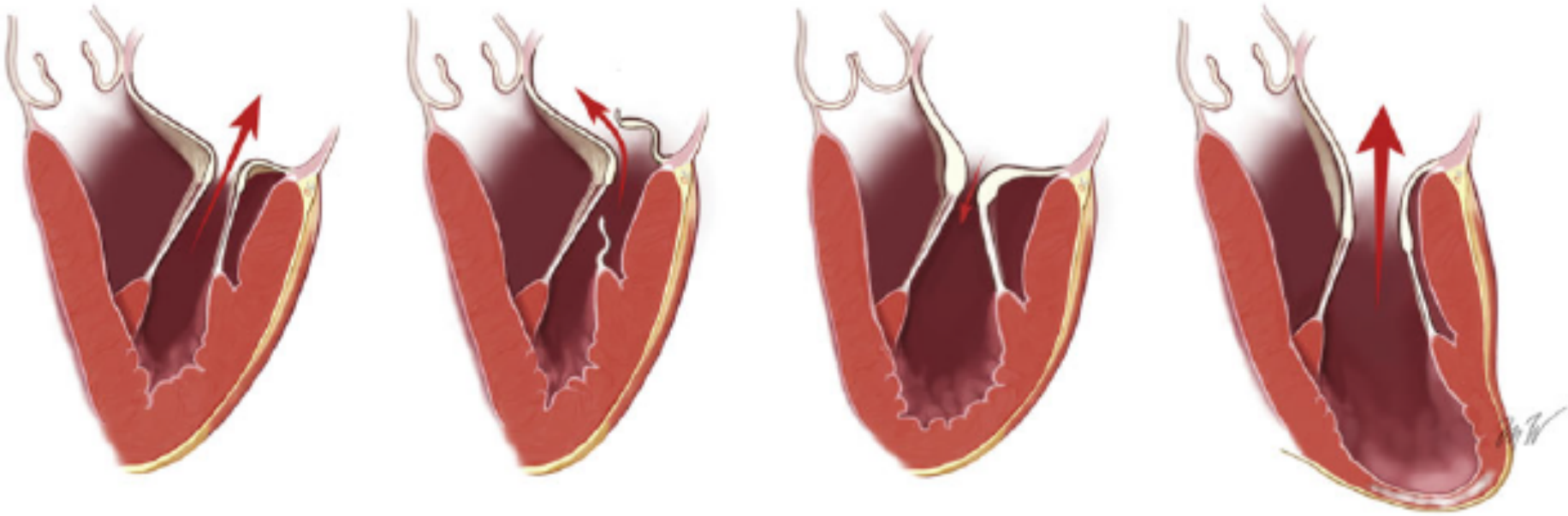
Milano 29 Marzo 2017

MitraClip : Le indicazioni emergenti nell'insufficienza mitralica secondaria. L'Everest ci aveva fornito indicazioni che appaiono già superate nella pratica clinica corrente. Una metodica nata per risolvere lesioni tipo II secondo Carpentier si sta impadronendo anche della correzione delle lesioni di tipo I, cosa fare?

Guido Gelpi, MD

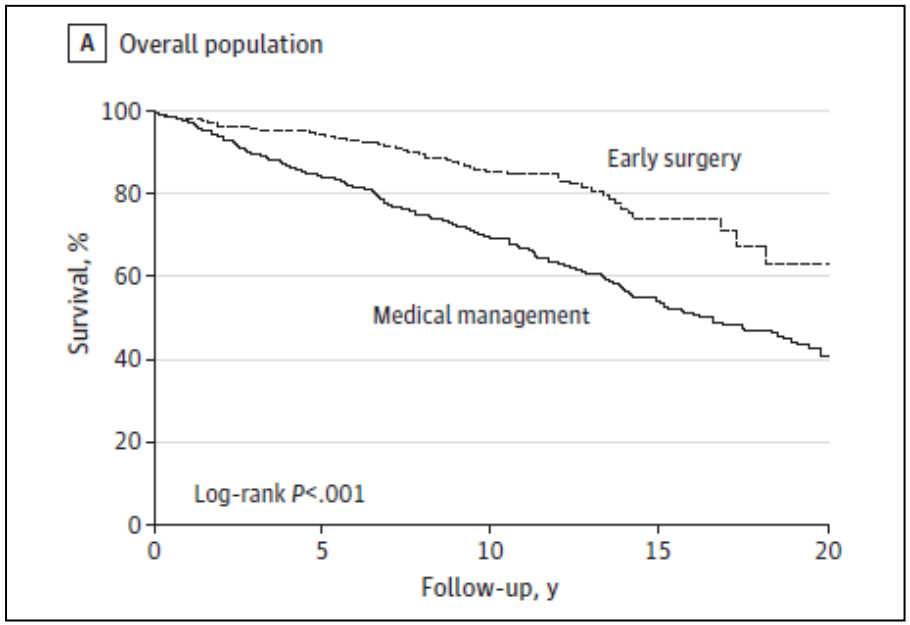
Cardio-Vascular Surgery Division of
"L.Sacco" Hospital, AAST Fatebenefratelli-Sacco,
University of Milan, Italy

The Mechanism of MR



Carpentier A. Cardiac valve surgery-the "French correction." J Thorac Cardiovasc Surg 1983;86:323–337.

Prognostic implications and Survival in *Primary/Degenerative* Mitral Regurgitation

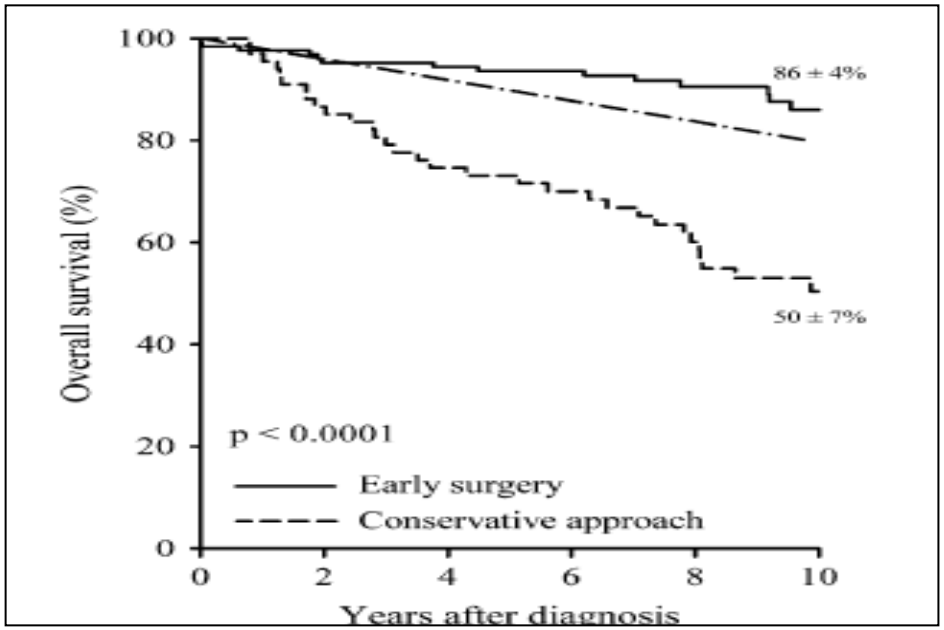


Association Between Early Surgical Intervention vs Watchful Waiting and Outcomes for Mitral Regurgitation Due to Flail Mitral Valve Leaflets

M. Suri et al, JAMA. 2013;310(6):609-616

N = 2097

Mean LV Ejection Fraction ~ 68%



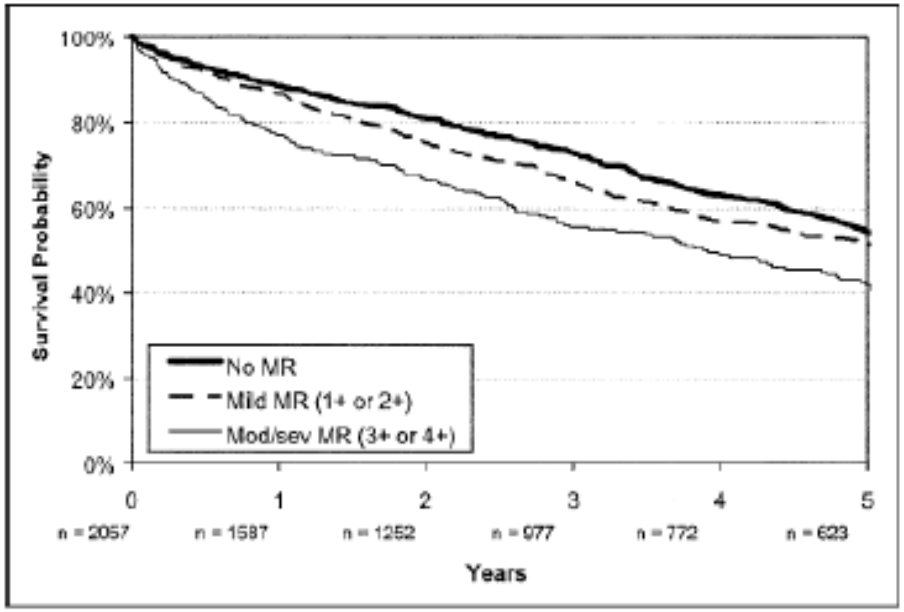
Long-term survival in asymptomatic patients with severe degenerative mitral regurgitation: a propensity score-based comparison between an early surgical strategy and a conservative treatment approach

Montant et al, The Journal of Thoracic and Cardiovascular Surgery. Volume 138, Number 6

N = 192

Mean LV Ejection Fraction ~ 70%

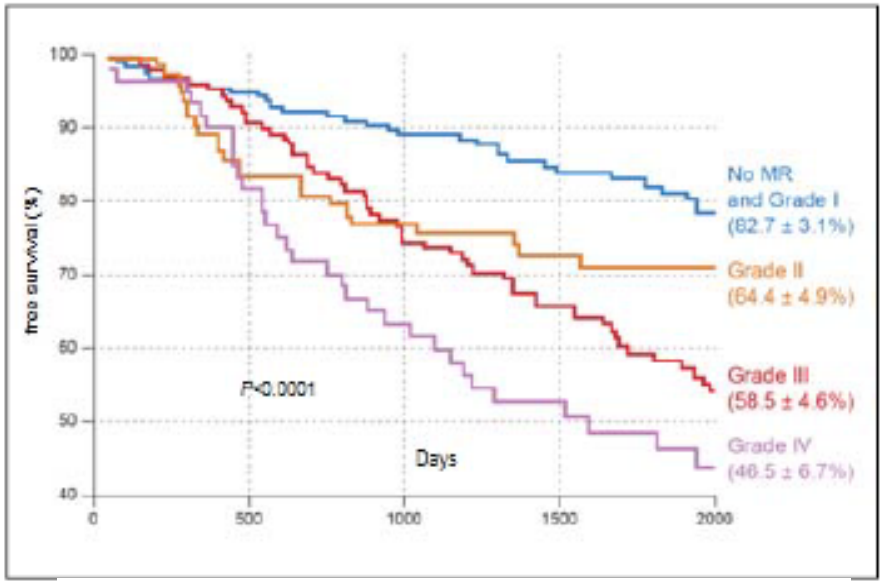
Prognostic implications and Survival in *Secondary/Functional* Mitral Regurgitation



Relation of frequency and severity of mitral regurgitation to survival among patients with left ventricular systolic dysfunction and heart failure

Benjamin H Trichon, Felker, Shaw, Cabell, O'Connor, MD
American Journal of cardiology
2003; Volume 91, 538–543

N = 2057
Mean LV Ejection Fraction< 40%



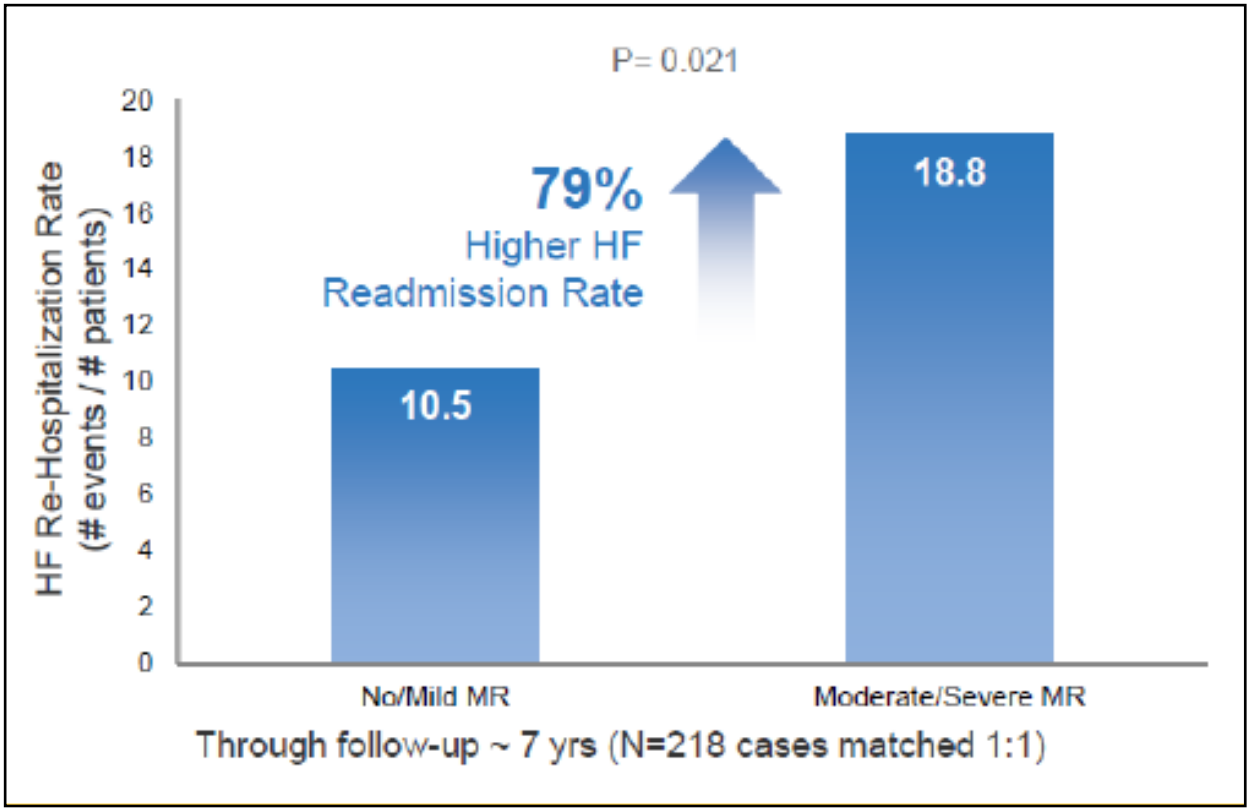
Prognostic implications of functional mitral regurgitation according to the severity of the underlying chronic heart failure: a long-term outcome study

Bursi F, Barbieri A, Grigioni F, et al. Eur J Heart Fail. 2010;12(4):382-388.

N = 469
Mean LV Ejection Fraction< 30%

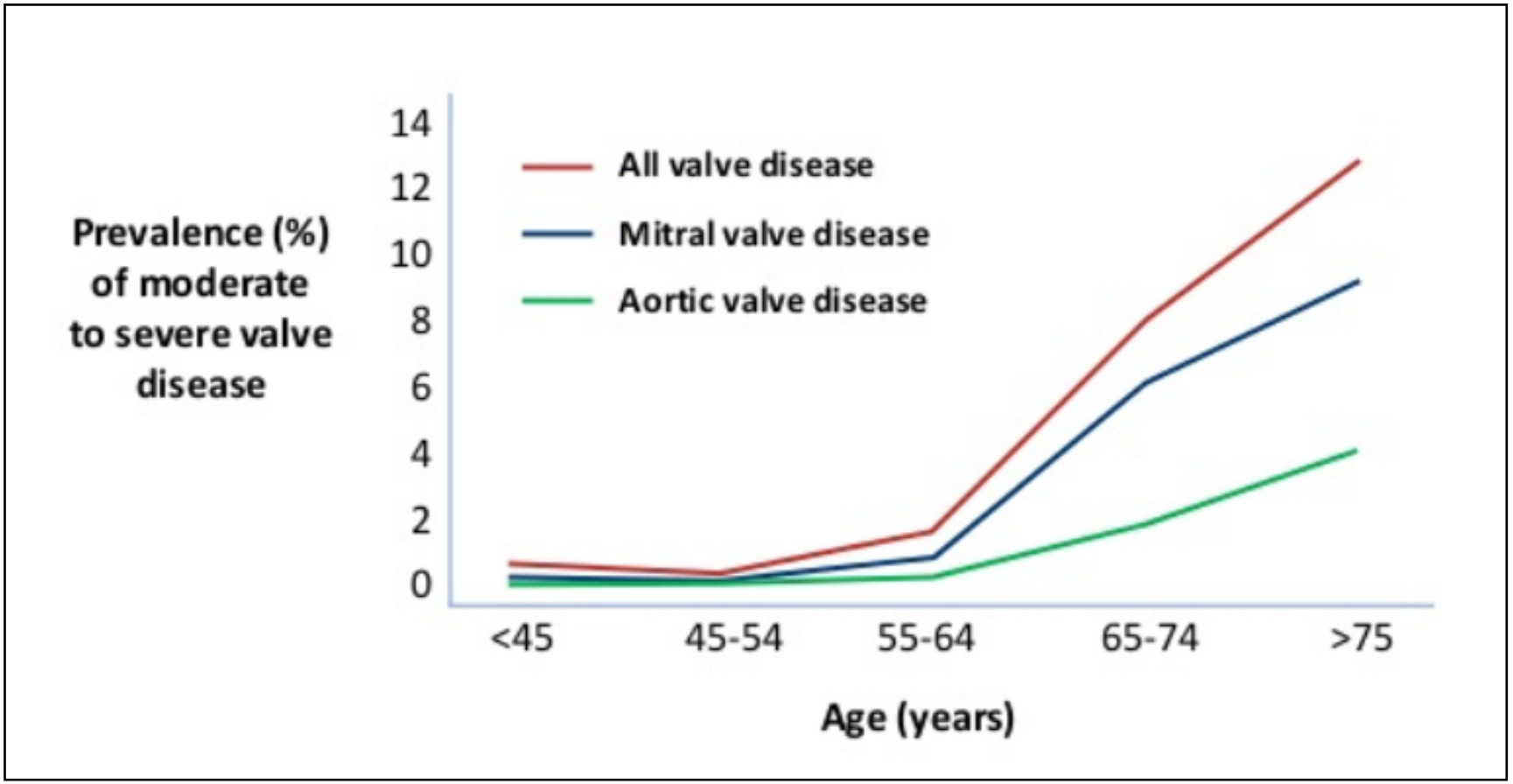
Severe MR Leads to Increased Hospital Admissions

Significantly higher hospital admissions experienced by patients with moderate to severe MR[1]



1. Markwick et al. Prognostic implications of moderate and severe mitral regurgitation in contemporary clinical care. TCT 2012

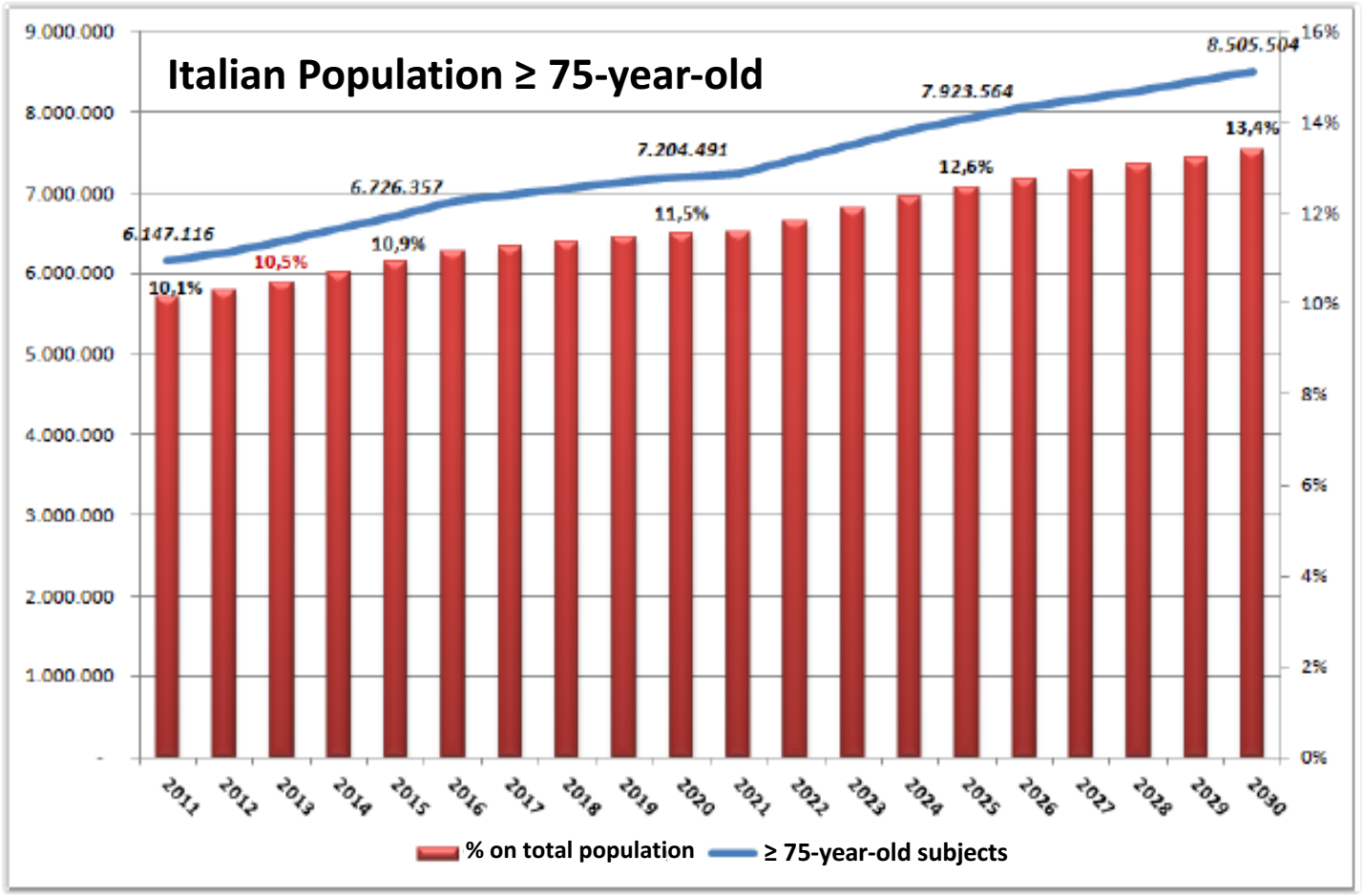
Prevalence of Mitral Regurgitation



Moderate or severe MR is estimated to be present in 1.7% of the adult population
The prevalence rises strikingly with advancing age **(> 9% for ≥ 75y.o. subjects, *p<.0001*)**[1]

1. Nkomo et al. Burden of valvular heart diseases: a population-based study. Lancet 2006 Sep 16;368(9540):1005-11.

Trend of Aging Population



Source: Italian National Institute for Statistical Studies (ISTAT). 2014

The «unmet need»

- Between January 1995 and December 2010, a total of **1441 patients was analyzed with a baseline characteristics of moderate/severe MR and severe LV dysfunction**

- Medical therapy was the dominant treatment strategy pursued in **1094 patients (75%);**

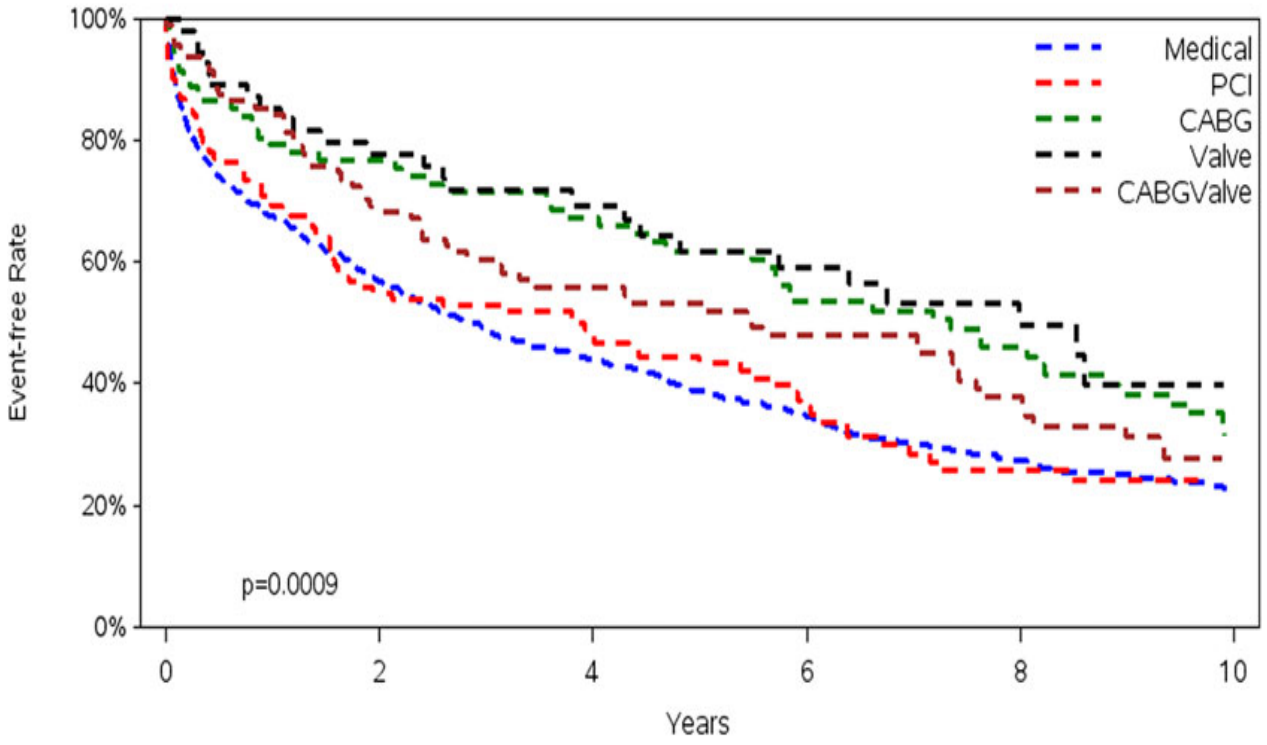
The medically managed cohort had **lower EF and larger LV diastolic dimensions** than patients in other treatment groups;

Management and outcomes in patients with moderate or severe functional mitral regurgitation and severe left ventricular dysfunction

Zainab Samad[1]*, Linda K. Shaw[2], Matthew Phelan[2], Mads Ersboll[3], Niels Risum[3], Hussein R. Al-Khalidi[2], Donald D. Glower[4], Carmelo A. Milano[4], John H. Alexander[1,2], Christopher M. O'Connor[1,2], Andrew Wang[1], and Eric J. Velazquez[1,2]

[1]Department of Medicine, Division of Cardiology, Duke Medicine, Durham, NC, USA; [2]Duke Clinical Research Institute, Duke Medicir of Copenhagen, Copenhagen, Denmark; and [4]Department of Surgery, Duke Medicine, Durham, NC, USA

European Heart Journal
doi:10.1093/eurheartj/ehv343



The «unmet need»

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Vol. 63, No. 2, 2014
ISSN 0735-1097/$36.00

CORRESPONDENCE

Research Correspondence

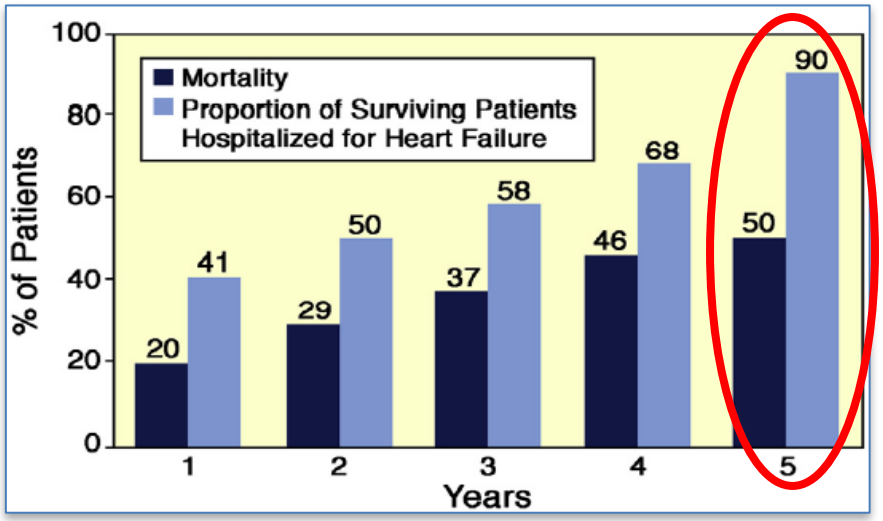
Prevalence and Outcomes of Unoperated Patients With Severe Symptomatic Mitral Regurgitation and Heart Failure

Comprehensive Analysis to Determine the Potential Role of MitraClip for This Unmet Need

- 2000-2008: identificati **5.737 con MR ≥ 3**
- **1095 pz. con IM severa ed HF** (814 FMR, 226 DMR)

518 operati (~47,3%)
577 non operati (~52%)

- **577 pz NON operati (~52%), Follow-Up a 5 anni:**
  - **mortalità → 50%**
  - **ospedalizzazioni → 90%**

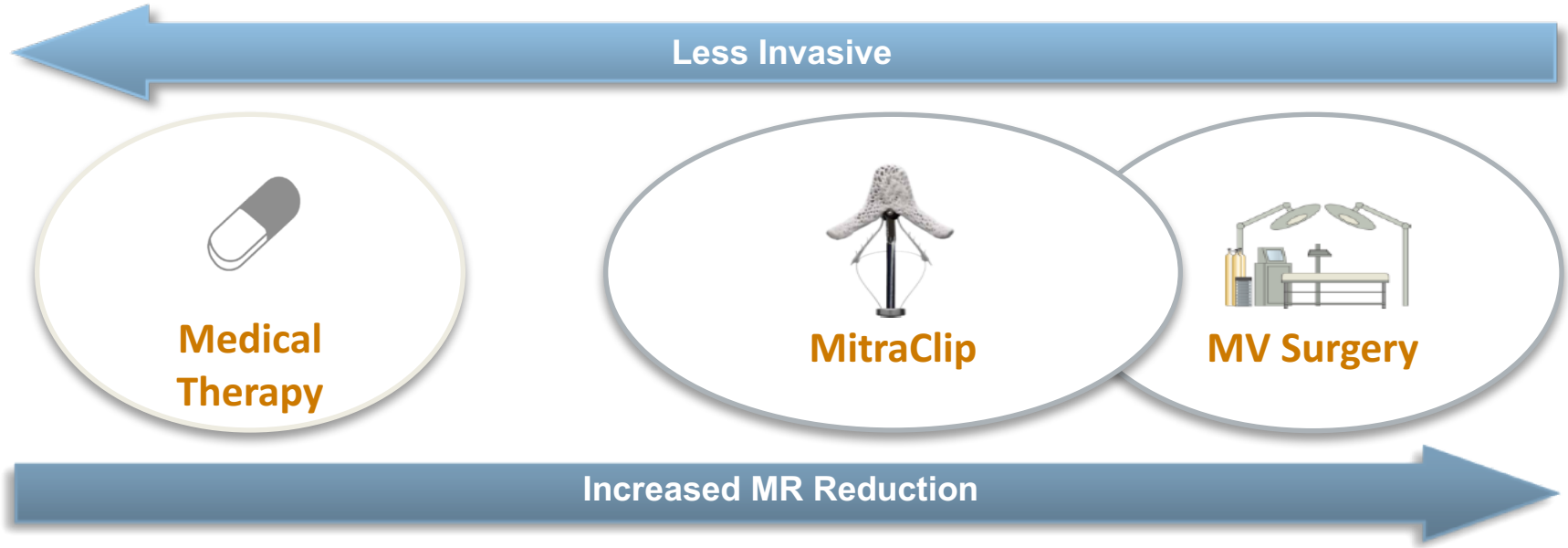


Main Factors prohibiting Surgery:

- **Impaired LVEF (<30%)**
- **Multiple comorbidities**
- **Advanced age**

MitraClip Therapy Filling a Treatment Gap

- Medical therapy is limited to symptom management
- MV surgery has been the only option that reliably reduces MR
- **A significant gap exists between patients who receive medical and surgical options, based on risk-benefit profile**
- MitraClip therapy is a first-in-class, minimally invasive catheter-based technology option to reduce MR



The MitraClip therapy: Rationale for intervention

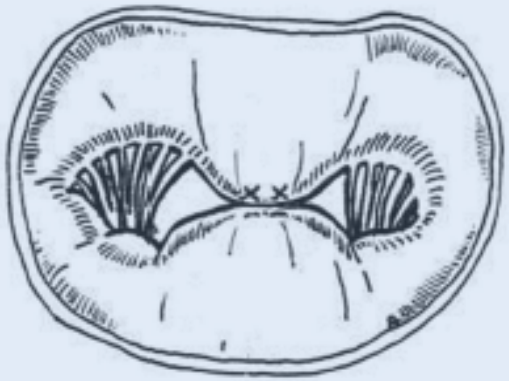
To reduce symptoms by reducing LA pressure under resting conditions

To prevent acute HF by reducing the chance of flash pulmonary edema

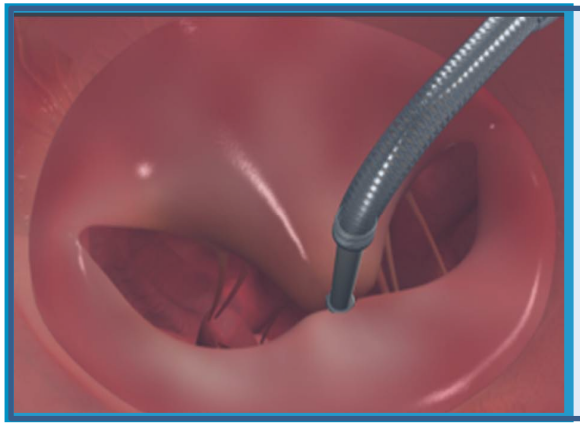
To improve compliance to therapy by increasing cardiac output

To initiate reverse remodeling by reducing volume overload

Concept: Percutaneous Mitral Valve Repair



- Double-orifice suture technique developed by Prof. Ottavio Alfieri
- First published results in 1998 illustrated proven benefit
- Suggested procedure best suited for minimally invasive approach

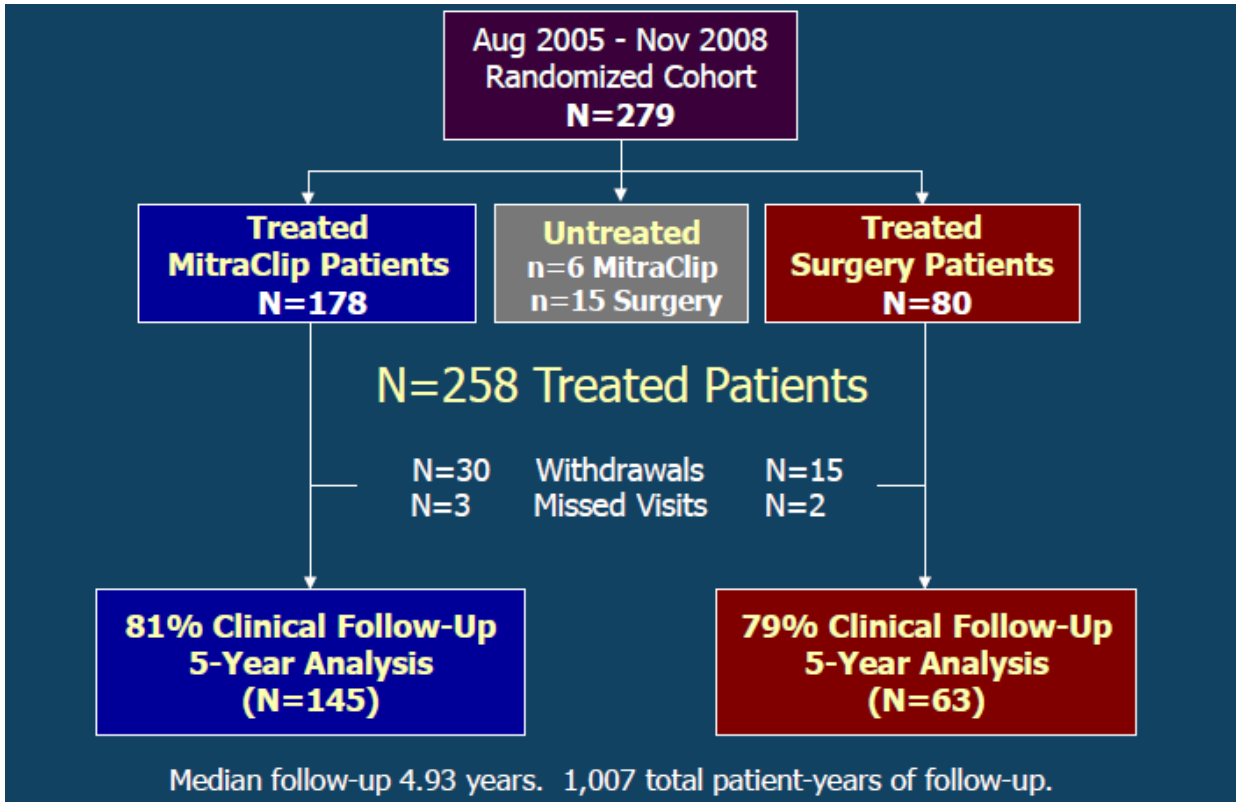


The MitraClip System performs **percutaneous mitral valve repair** by creating a vertical line of coaptation, forming a double–orifice valve.

- Beating heart procedure—no cardiopulmonary bypass
- Allows for real–time positioning and repositioning to optimize MR reduction

EVEREST II Randomized Controlled Trial
(Endovascular Valve Edge-to-Edge REpair Study)

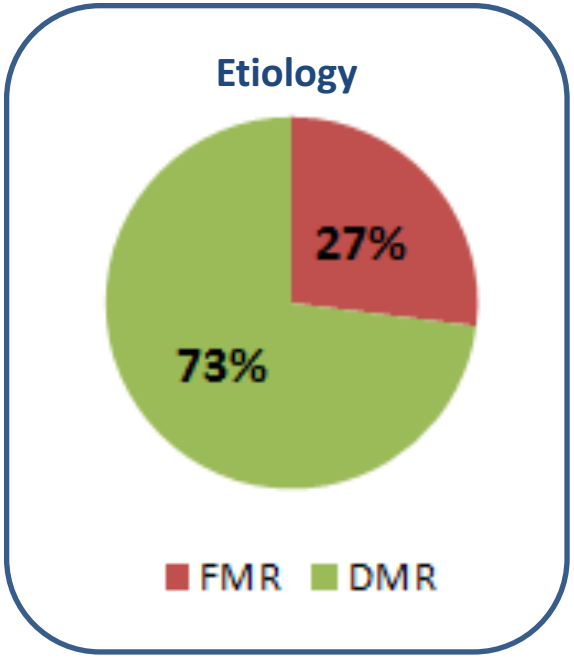
The EVEREST II RCT was a prospective, multi-center trial designed to compare the **safety and effectiveness** of the MitraClip System with mitral valve surgery in the treatment of patients with significant (≥3+) mitral regurgitation



The NEW ENGLAND JOURNAL of MEDICINE

Percutaneous Repair or Surgery for Mitral Regurgitation

Ted Feldman, M.D., Elyse Foster, M.D., Donald G. Glower, M.D., Saibal Kar, M.D., Michael J. Rinaldi, M.D., Peter S. Fail, M.D., Richard W. Smalling, M.D., Ph.D., Robert Siegel, M.D., Geoffrey A. Rose, M.D., Eric Engeron, M.D., Catalin Loghin, M.D., Alfredo Trento, M.D., Eric R. Skipper, M.D., Tommy Fudge, M.D., George V. Letsou, M.D., Joseph M. Massaro, Ph.D., and Laura Mauri, M.D., for the EVEREST II Investigators*



Feldman T, ACC 2014 Washington

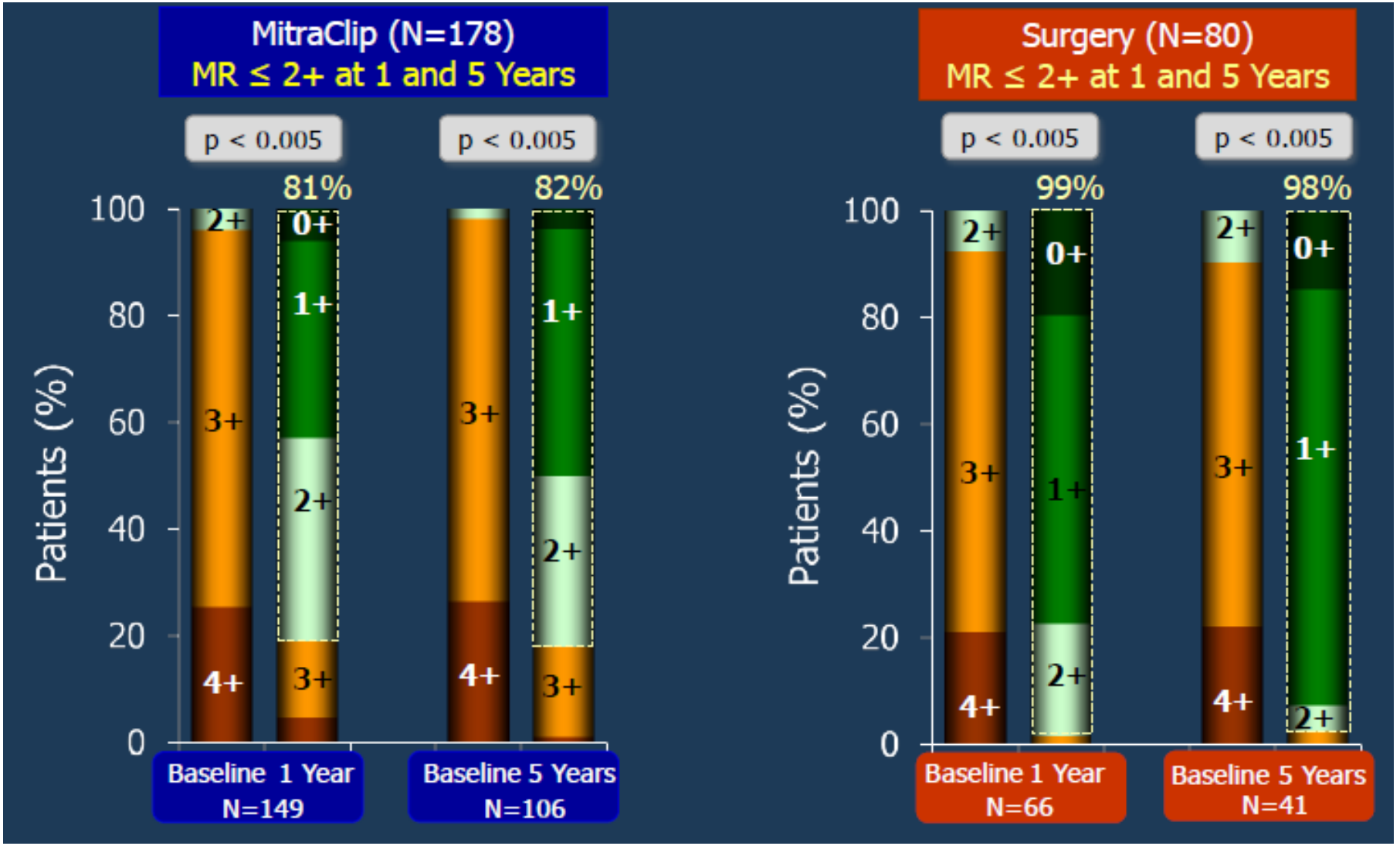
Long- Term MitraClip Device Safety

	Through 1 Year # (%) of patients	1 Year to 5 Years # (%) of patients
Single Leaflet Device Attachment (SLDA)	10 (6.3%)	0 (0.0%)
MV stenosis	1 (0.6%)	0 (0.0%)
Device Embolization	0 (0.0%)	0 (0.0%)

Based on N=158 who were implanted with 1 or 2 MitraClip devices

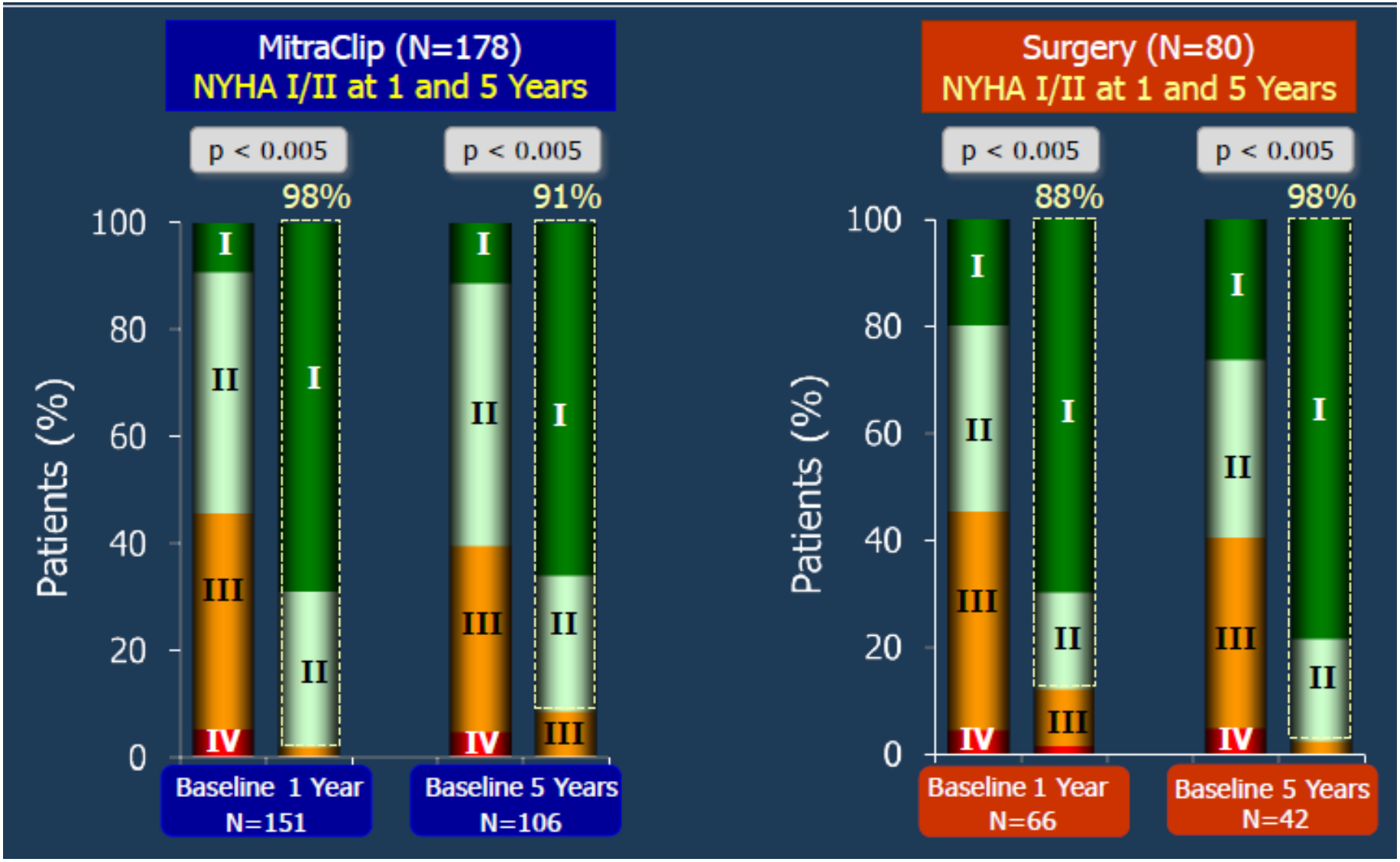
Feldman T, ACC 2014 Washington

Mitral Regurgitation Grade



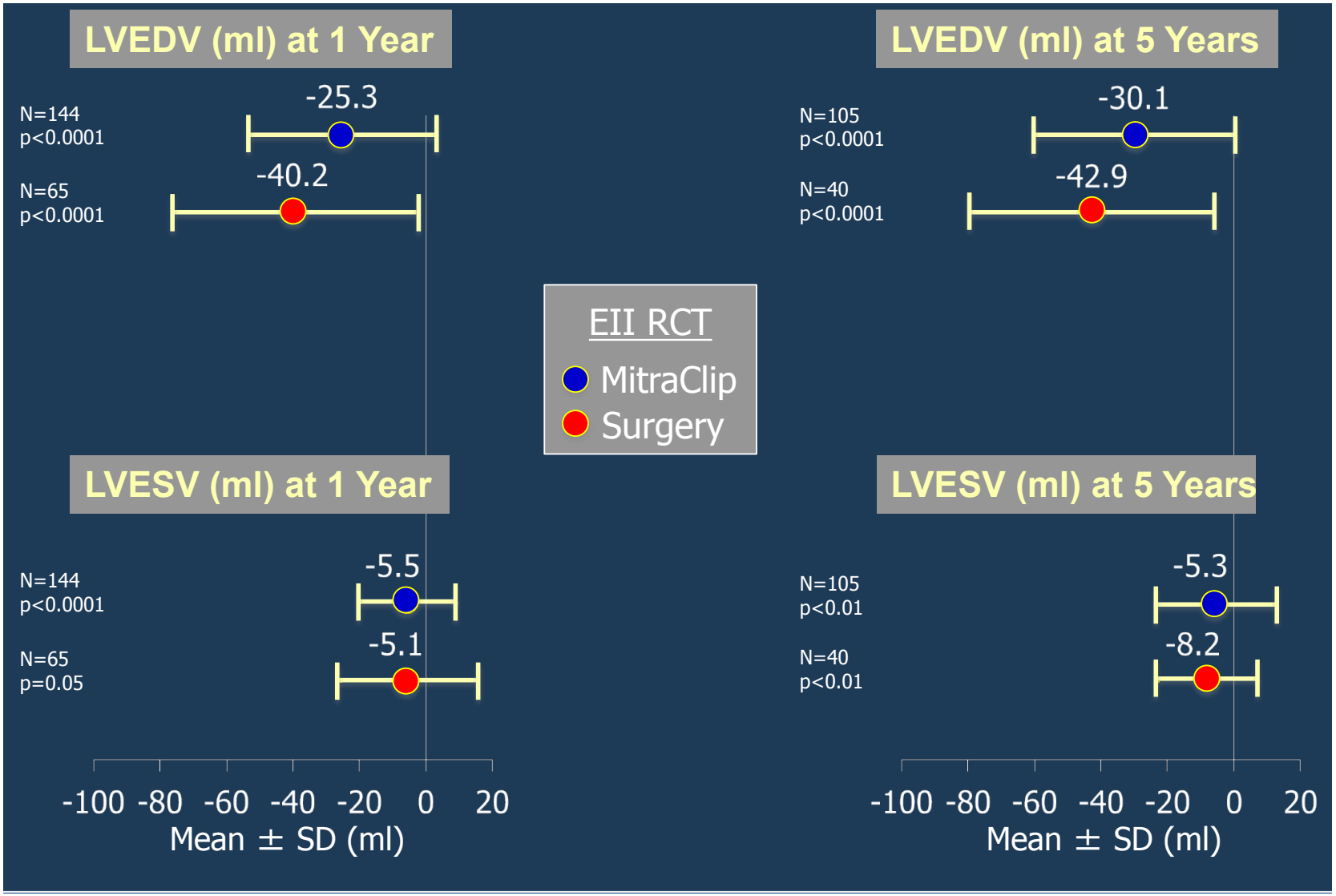
Feldman T, ACC 2014 Washington

NYHA Funtional Class



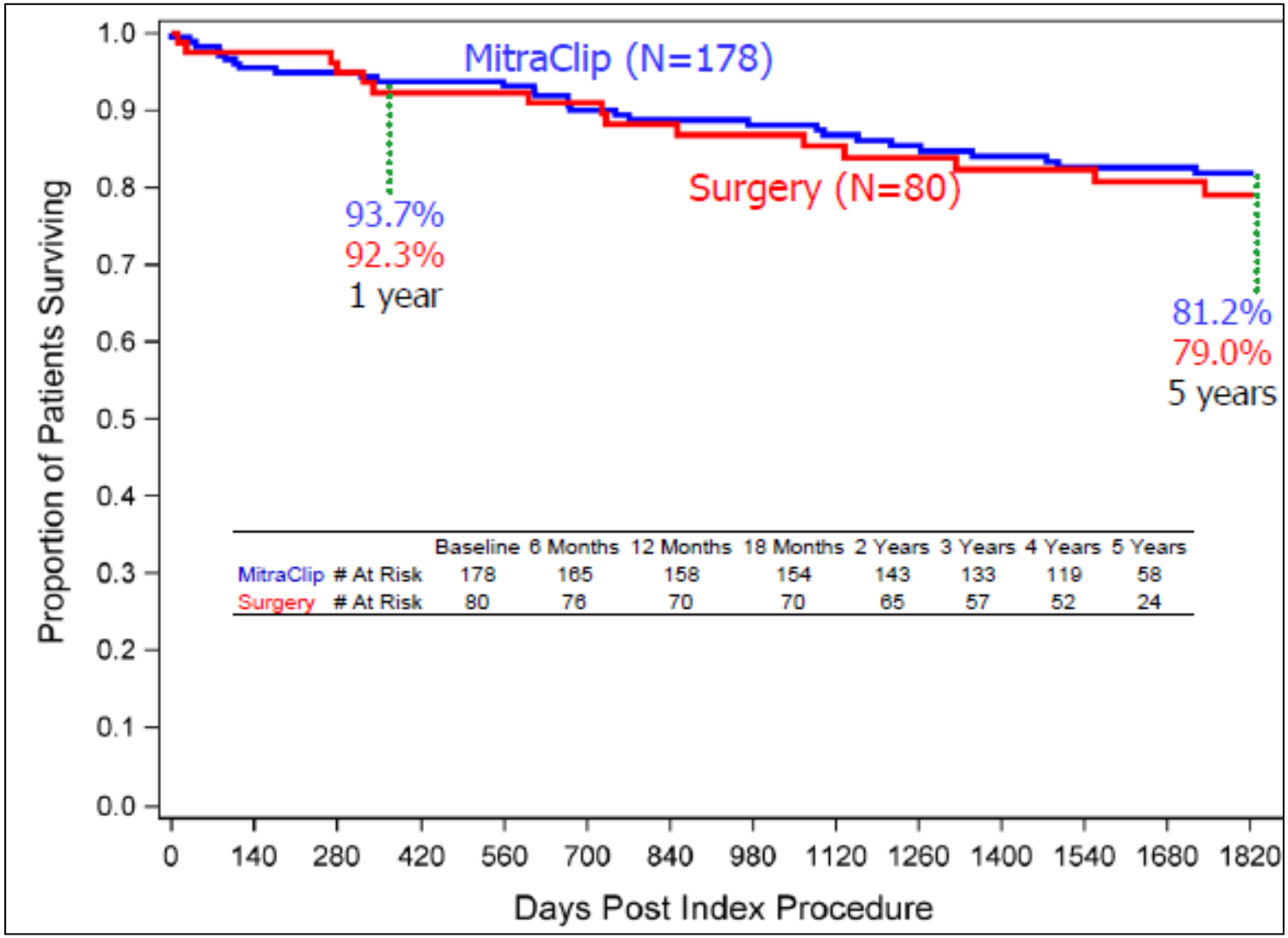
Feldman T, ACC 2014 Washington

Reduction in LV Volumes at 1 and 5 years



Feldman T, ACC 2014 Washington

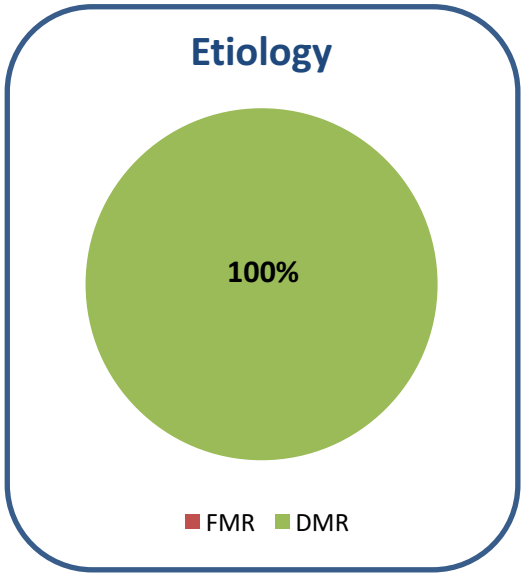
5-Years FU mortality in EVEREST II



		Baseline	6 Months	12 Months	18 Months	2 Years	3 Years	4 Years	5 Years
MitraClip	# At Risk	178	165	158	154	143	133	119	58
Surgery	# At Risk	80	76	70	70	65	57	52	24

Feldman T, ACC 2014 Washington

REALISM Registry: Everest II Continued access study in the real-world

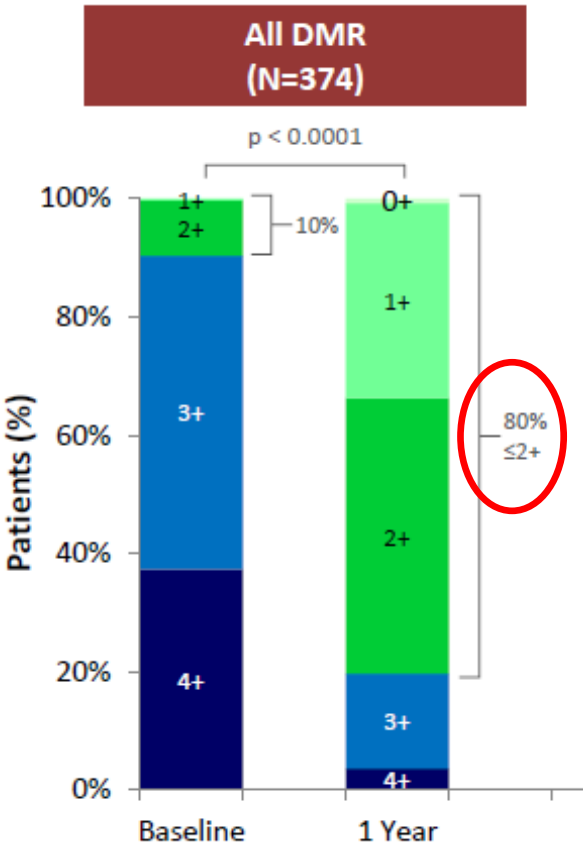


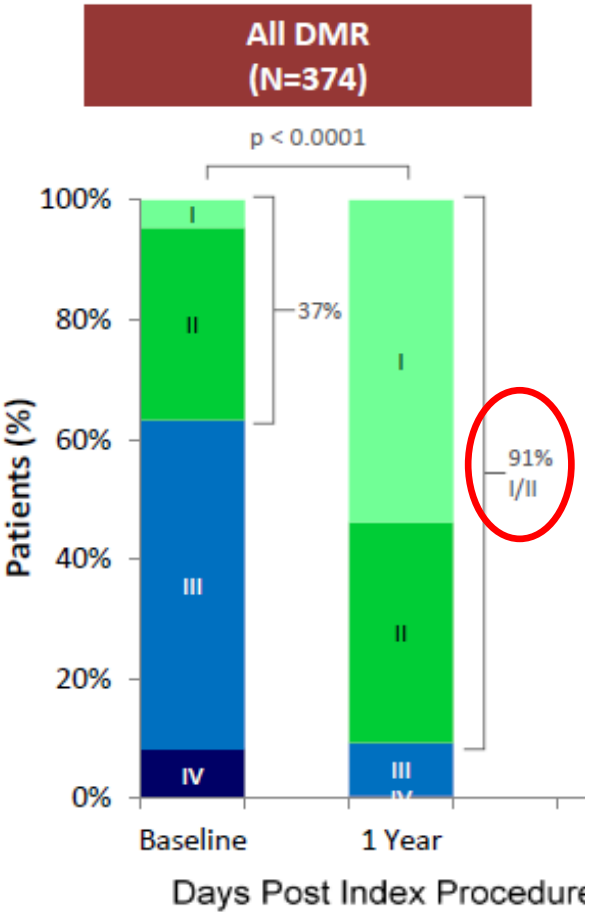
N = 374

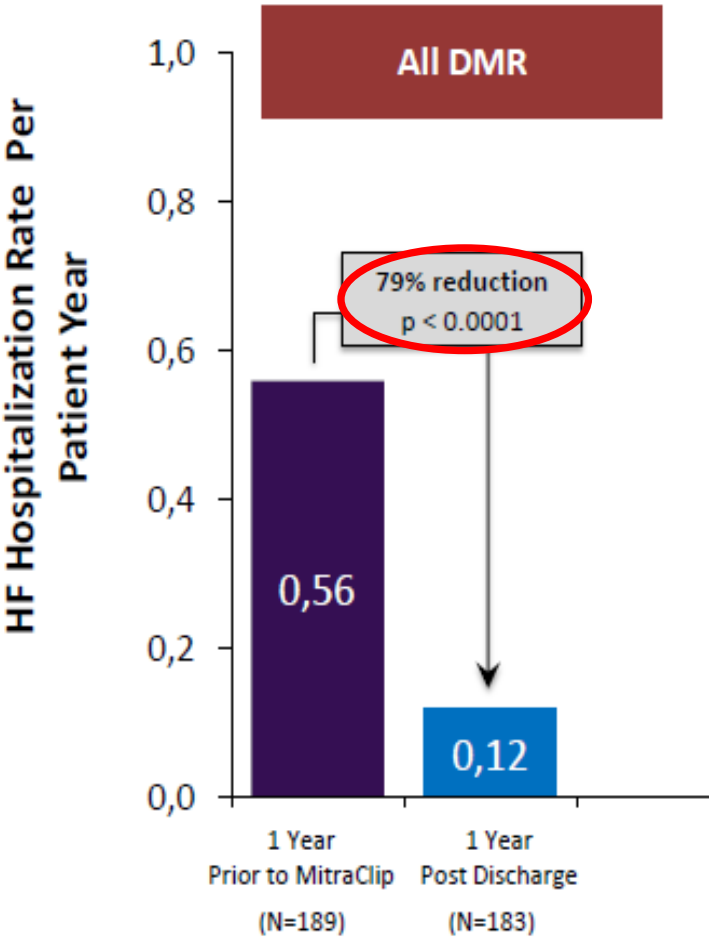
Baseline Characteristics	All DMR (N=374)
Core Lab Assessed MR ≥3+	90%
Age (mean ± SD)	79 ±11 years
Female	55%
Coronary Artery Disease	52%
Previous CABG	25%
Atrial Fibrillation	64%
Cerebrovascular Disease	17%
Diabetes	19%
Moderate to Severe Renal Disease	17%
Chronic Obstructive Pulmonary Disease	26%
LV Ejection Fraction (mean±SD)	60 ± 8%
LV End Diastolic Volume (mean±SD)	126 ± 42 ml

Saibal Kar. EuroPCR 2016. Paris, France

REALISM Registry: Outcome







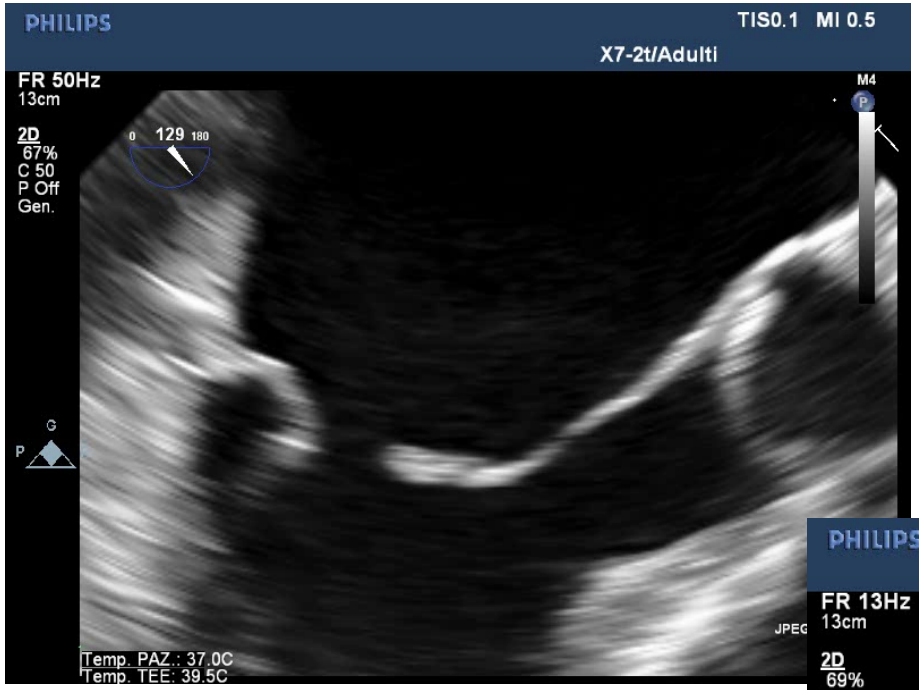
Saibal Kar. EuroPCR 2016. Paris, France

Degenerative Mitral Regurgitation

Maschio 85 anni

- FRC: ipertensione arteriosa
- PAT ASS: BPCO. Pregresso potus. Gastrite cronica con pregresso riscontro di ulcera peptica e angiodisplasia.
- AN CARDIOLOGICA:
  - FA permanente
  - 9/2016: ricovero per SCC con riscontro di IM severa
  - 11/2016: ricovero per SCC e BPCO riacutizzata
  - 12/2016: ricovero per SCC. Coronarie indenni.

DMR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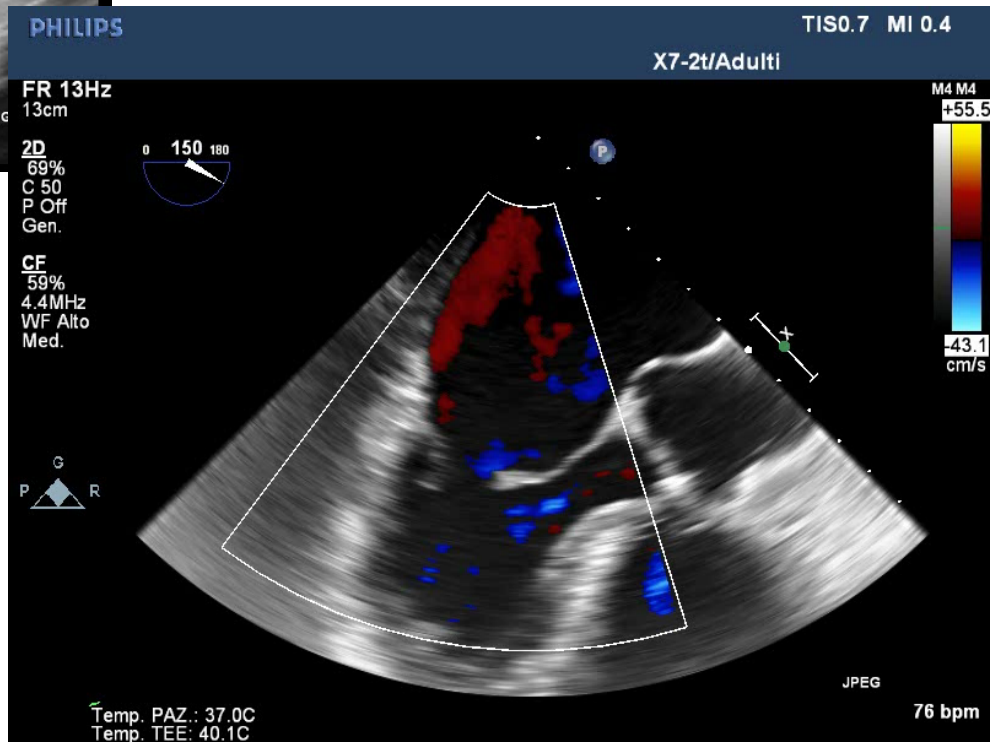
M4
Temp. PAZ.: 37.0C
Temp. TEE: 39.5C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C 50
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CF
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WF Alto
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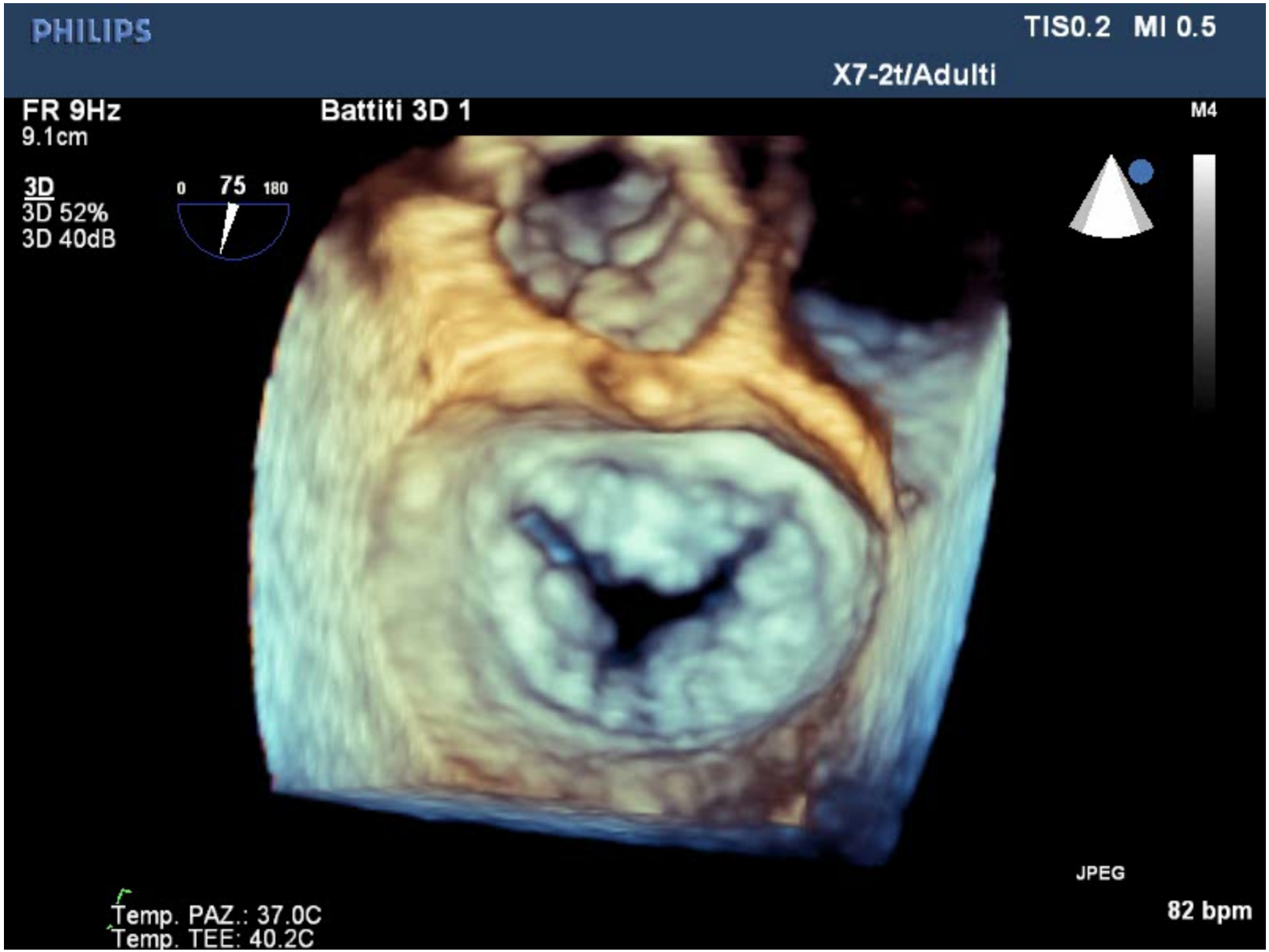
76 bpm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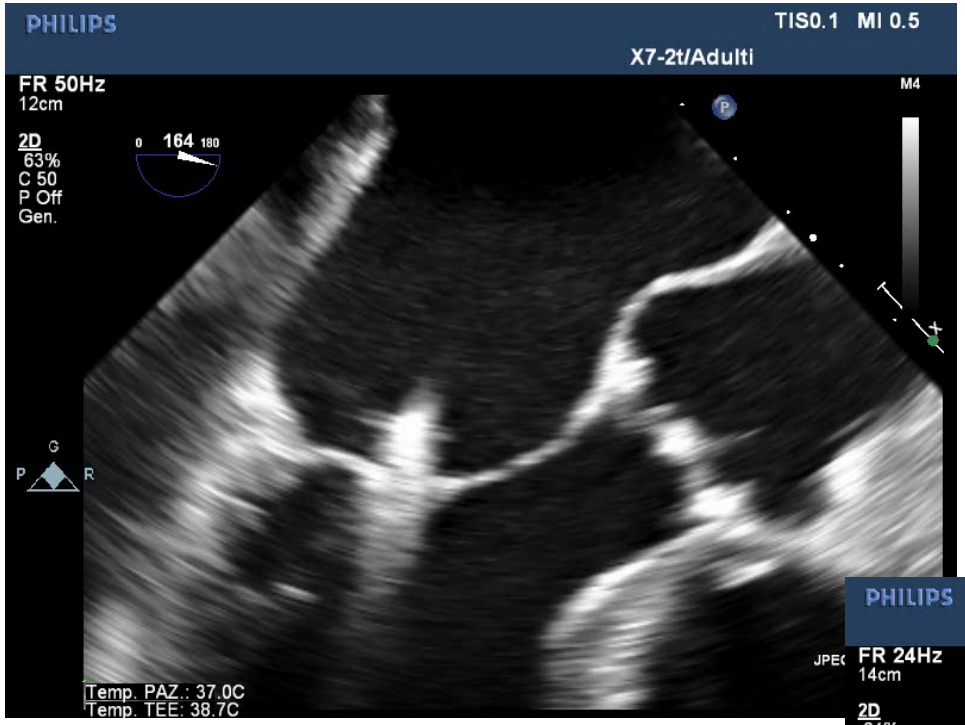
Temp. TEE: 40.2C
82 bpm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C 50
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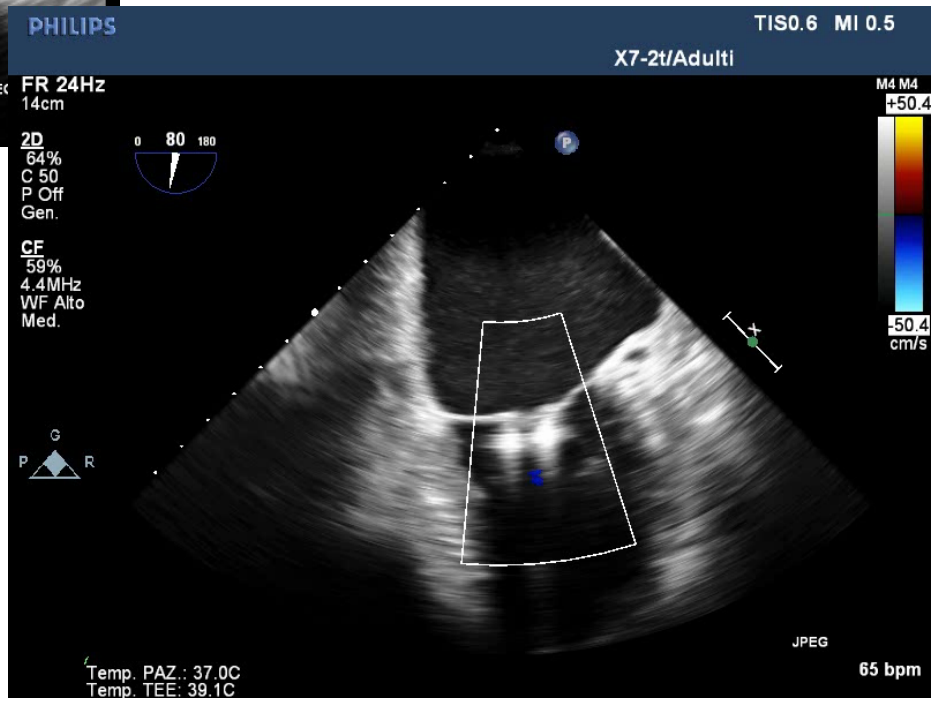
Temp. TEE: 38.7C

DMR treated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59%
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WF Alto
Med.
M4 M4
+50.4
-50.4
cm/s
JPEG
65 bpm
Temp. PAZ.: 37.0C
Temp. TEE: 39.1C

Curr Cardiol Rep (2016) 18: 129
DOI 10.1007/s11886-016-0809-7

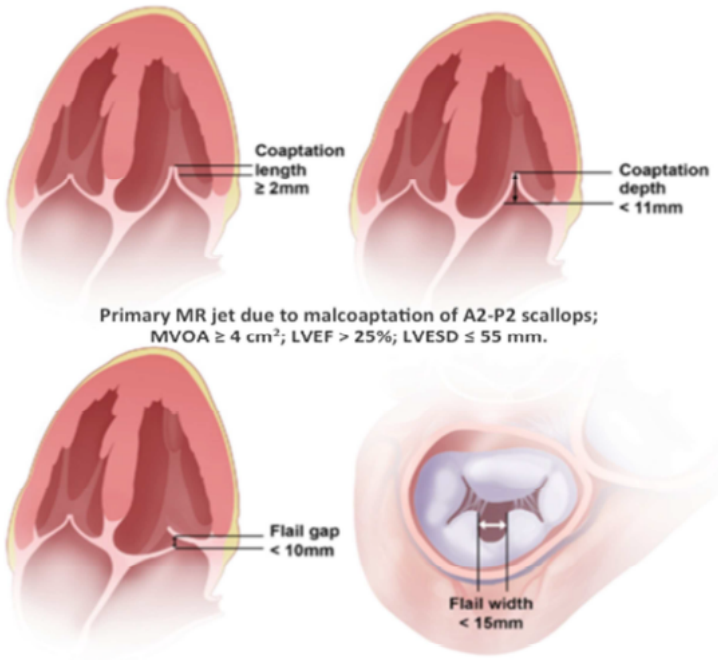
VALVULAR HEART DISEASE (A WANG, SECTION EDITOR)

Percutaneous Mitral Valve Repair with MitraClip: Patient and Valve Selection for Optimal Outcome

Devdas T. Inderbitzin[1] · Maurizio Taramasso[1] · Fabian Nietlispach[2] · Francesco Maisano[1]

- *The main objective of the **EVEREST Criteria was to ensure acute efficacy**. By the time, most criteria have been surpassed, since **experienced physicians dedicated to TMVR** have found technical solutions to achieve acute successful reduction of MR*

- ***The increasing number of elderly polymorbid patients with an inacceptable risk for surgery are part of the real world and should not be neglected**. With the worldwide spreading post-market use of the MitraClip, **the indications have rapidly been expanded towards FMR** and inoperable patients, especially in Europe*



ESC/EACTS 2012 Guidelines on the Management of valvular heart disease[1]

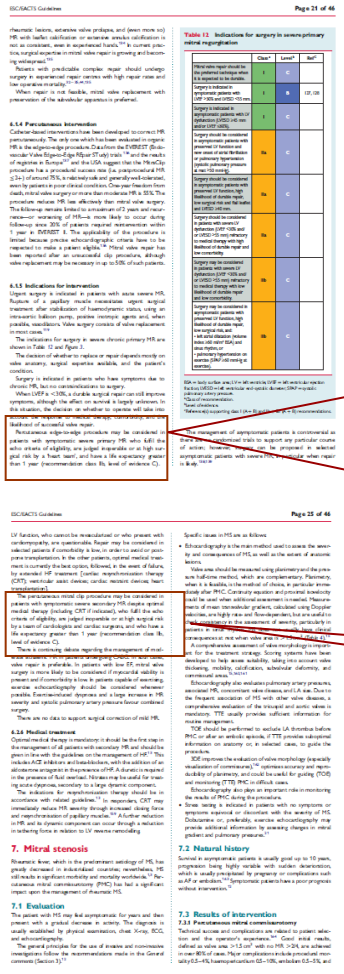
European Heart Journal
doi:10.1093/eurheartj/ehs109

ESC/EACTS GUIDELINES

Guidelines on the management of valvular heart disease (version 2012)

The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

Authors/Task Force Members: Alec Vahanian (Chairperson) (France)*, Ottavio Alfieri (Chairperson)* (Italy), Felicita Andreotti (Italy), Manuel J. Antunes (Portugal), Gonzalo Barón-Esquivias (Spain), Helmut Baumgartner (Germany), Michael Andrew Borger (Germany), Thierry P. Carrel (Switzerland), Michele De Bonis (Italy), Arturo Evangelista (Spain), Volkmar Falk (Switzerland), Bernard Iung (France), Patrizio Lancellotti (Belgium), Luc Pierard (Belgium), Susanna Price (UK), Hans-Joachim Schäfers (Germany), Gerhard Schuler (Germany), Janina Stepinska (Poland), Karl Swedberg (Sweden), Johanna Takkenberg (The Netherlands), Ulrich Otto Von Oppell (UK), Stephan Windecker (Switzerland), Jose Luis Zamorano (Spain), Marian Zembala (Poland)



Indicazioni per IM Degenerativa

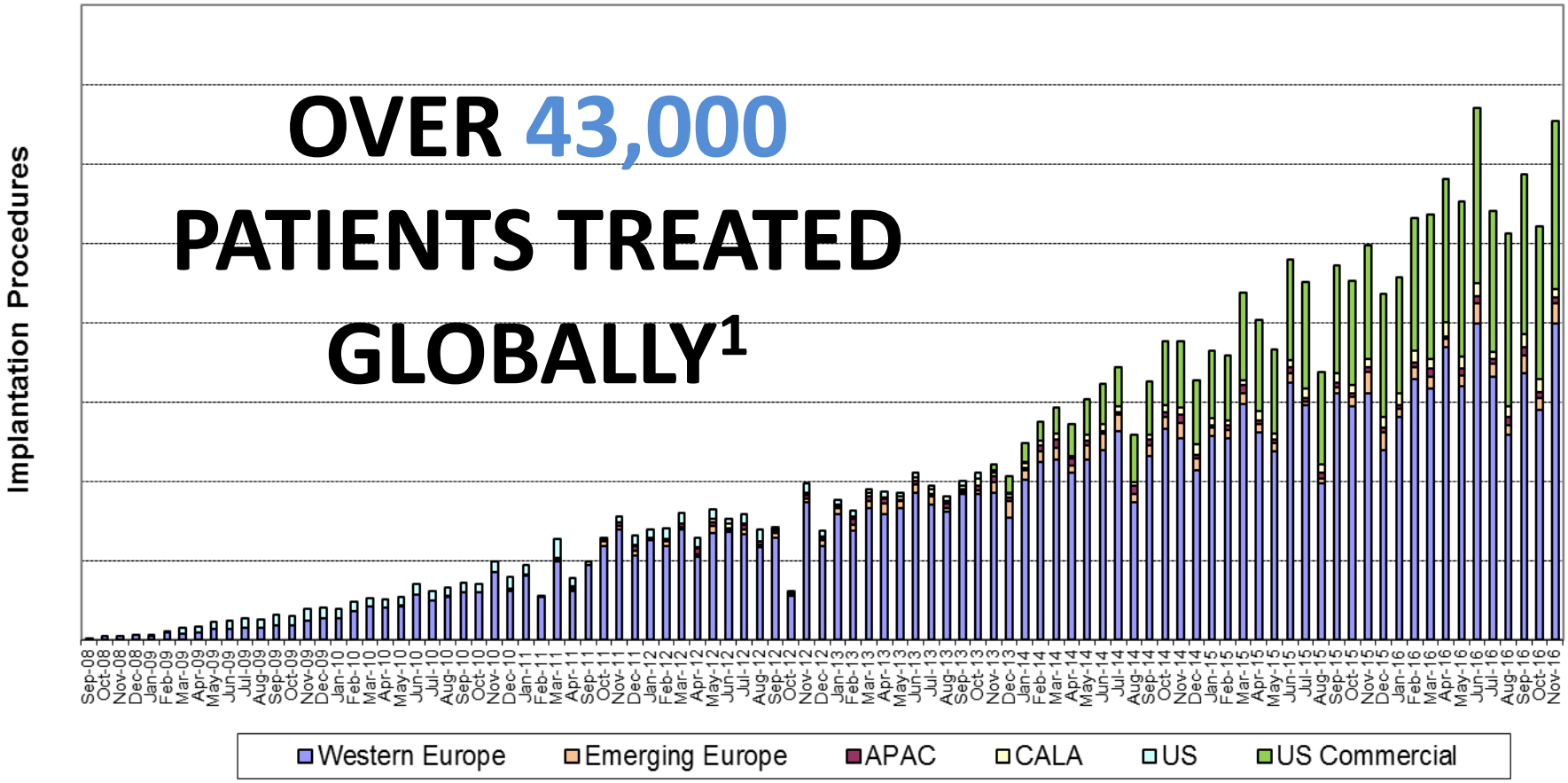
*" **<u>La procedura percutanea edge-to-edge può essere presa in considerazione in pazienti sintomatici con severe insufficienza mitralica primaria che rispondono ai criteri di eleggibilità, sono giudicati inoperabili o ad alto rischio chirurgico</u>** da un "heart team", e hanno un'aspettativa di vita maggiore di 1 anno (classe di raccomandazione IIb, livello di evidenza C)"*

Indicazioni per IM Funzionale

*"**<u>La procedura percutanea MitraClip può essere presa in considerazione in pazienti sintomatici con severe insufficienza mitralica secondaria nonostante ottima terapia medica (incluso la CRT se indicato)</u>**, che rispondono ai criteri di eleggibilità, sono giudicati inoperabili o ad alto rischio chirurgico da un team di cardiologi e cardiochirurghi", e hanno un'aspettativa di vita maggiore di 1 anno (classe di raccomandazione IIb, livello di evidenza C)"*

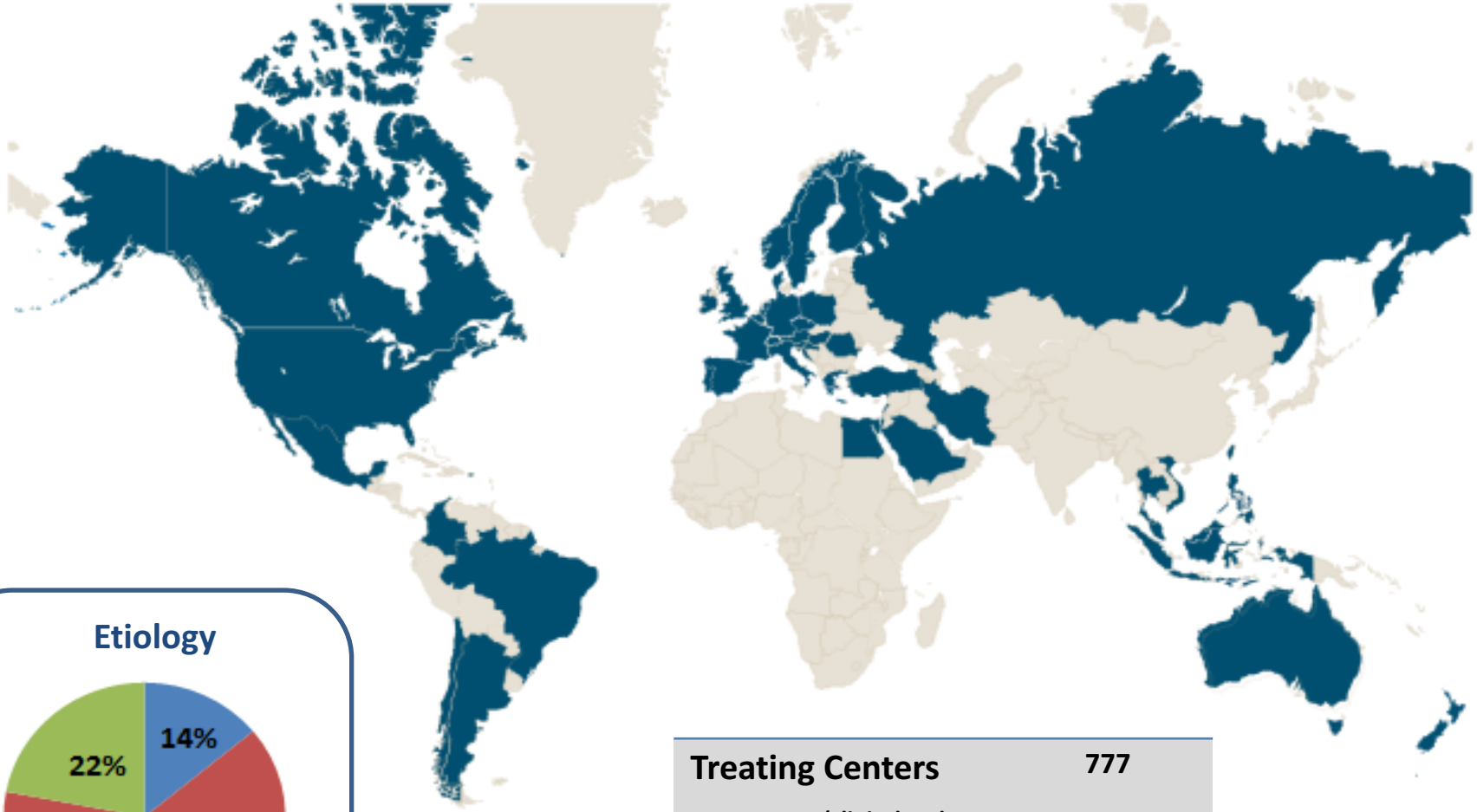
Source: http://www.escardio.org/guidelines-surveys/esc-guidelines/Pages/valvular-heart-disease.aspx

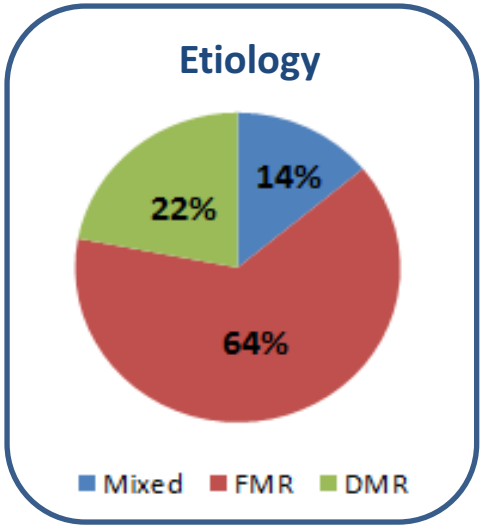
Global MitraClip Experience



1. Includes clinical and commercial procedures as of 30/11/2016. Source: Data on file at Abbott Vascular

MitraClip Therapy Current Global Adoption





Treating Centers	**777**
Patients (clinical and commercial)	**Over 42,000**
Implant Rate[1]	**97%**

1. First-time procedures only. Includes commercial patients, ACCESS I and ACCESS II patients
2. OUS Commercial Experience
3. Etiology not inclusive of U.S. cases as of 14/04/2014. Data As of November 30, 2016.

Source: Data on file at Abbott Vascular

MitraClip in Specific Patient Population

Patient groups in which significant clinical benefits have been reported:

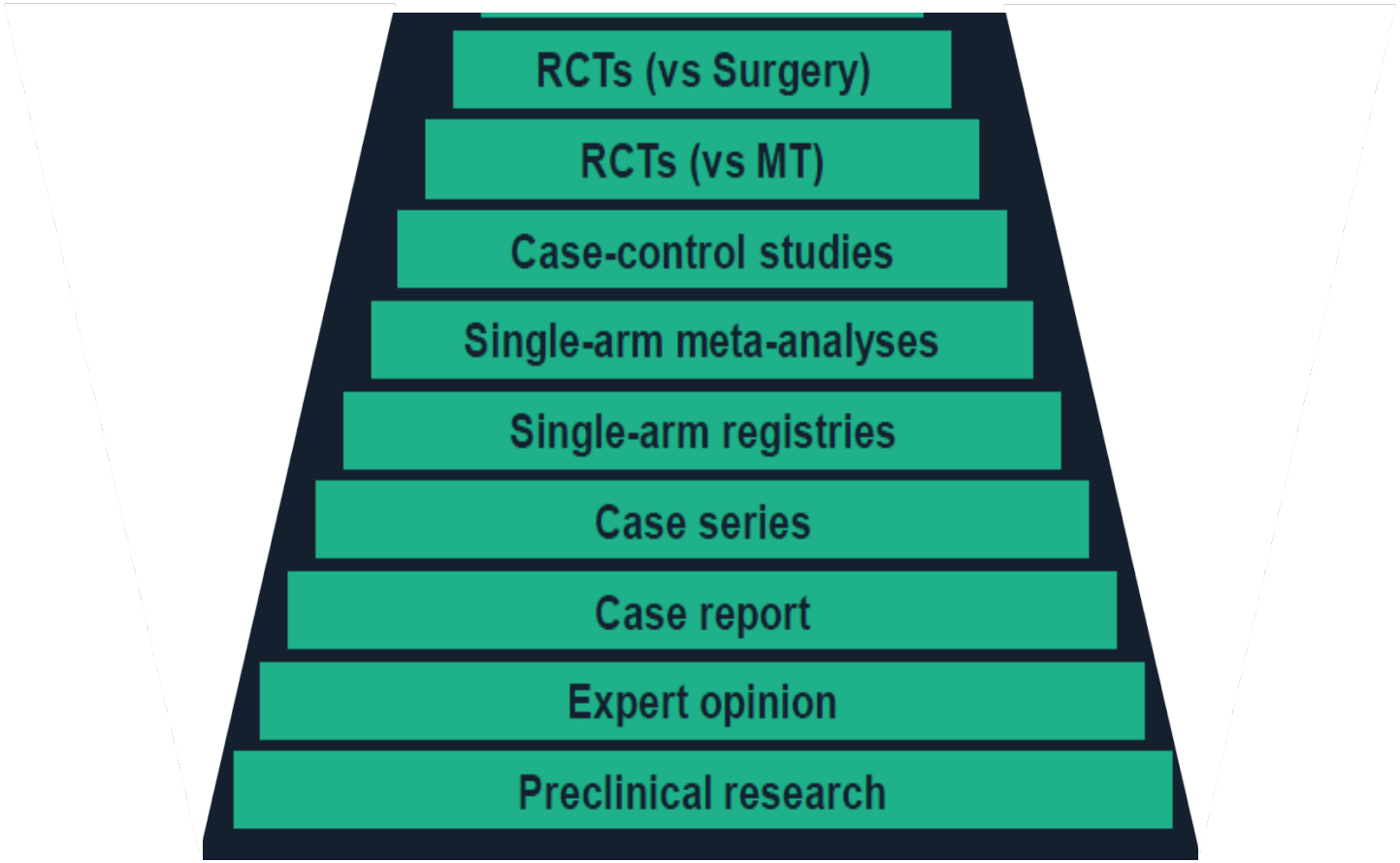
- Degenerative MR, declined for surgery[1]
- Severe LV dysfunction refractory to medical therapy[2]
- Severe Heart Failure, despite optimal medical therapy[3]
- CRT non-responders[4]
- Bivalvular Disease: Severe Aortic Stenosis and Mitral Regurgitation[5]

The following parameters should be taken into consideration by the Heart Team[6]:

- Moderate to severe or severe MR (Functional or Degenerative)
- Echocardiographic criteria for eligibility
- Level of surgical risk
- Greater than one year life expectancy

1. Reichenspurner, H. et al. Clinical Outcomes through 12 months in patients with Degenerative Mitral Regurgitation treated with the MitraClip device in the ACCESS-Europe Phase I trial. Eur J Cardiothoracic Surgery. 2013: 44:e 280-288. 2. Franzen O, Baldus S, Rudolph V, et al. Acute outcomes of MitraClip therapy for mitral regurgitation in high-surgical-risk patients: Emphasis on adverse valve morphology and severe left ventricular dysfunction. Eur Heart J. 2010; 31:1373-1381. 3. Franzen et al. MitraClip Therapy In Patients With End-Stage Systolic Heart Failure. Eur J Heart Failure. 2011; 13: 569-576. 4. Auricchio et al. Correction of Mitral Regurgitation in Nonresponders To Cardiac Resynchronization Therapy By MitraClip Improves Symptoms And Promotes Reverse Remodeling. JACC 2011; 58: 2183-2189. 5. Rudolph V, Schirmer J, Franzen O, Schlüter M, Seiffert M, Treede H, Reichenspurner H, Blankenberg S, Baldus S. Bivalvular transcatheter treatment of high-surgical-risk patients with coexisting severe aortic stenosis and significant mitral regurgitation. Int J Cardiol. 2013; 167(3):716-20. 6. ESC/EACTS 2012 Guidelines on the management of valvular heart disease. Eur Heart J (2012) 33, 2451–2496.

MitraClip Clinical Experience: Growing the Clinical Evidence



Cases Series

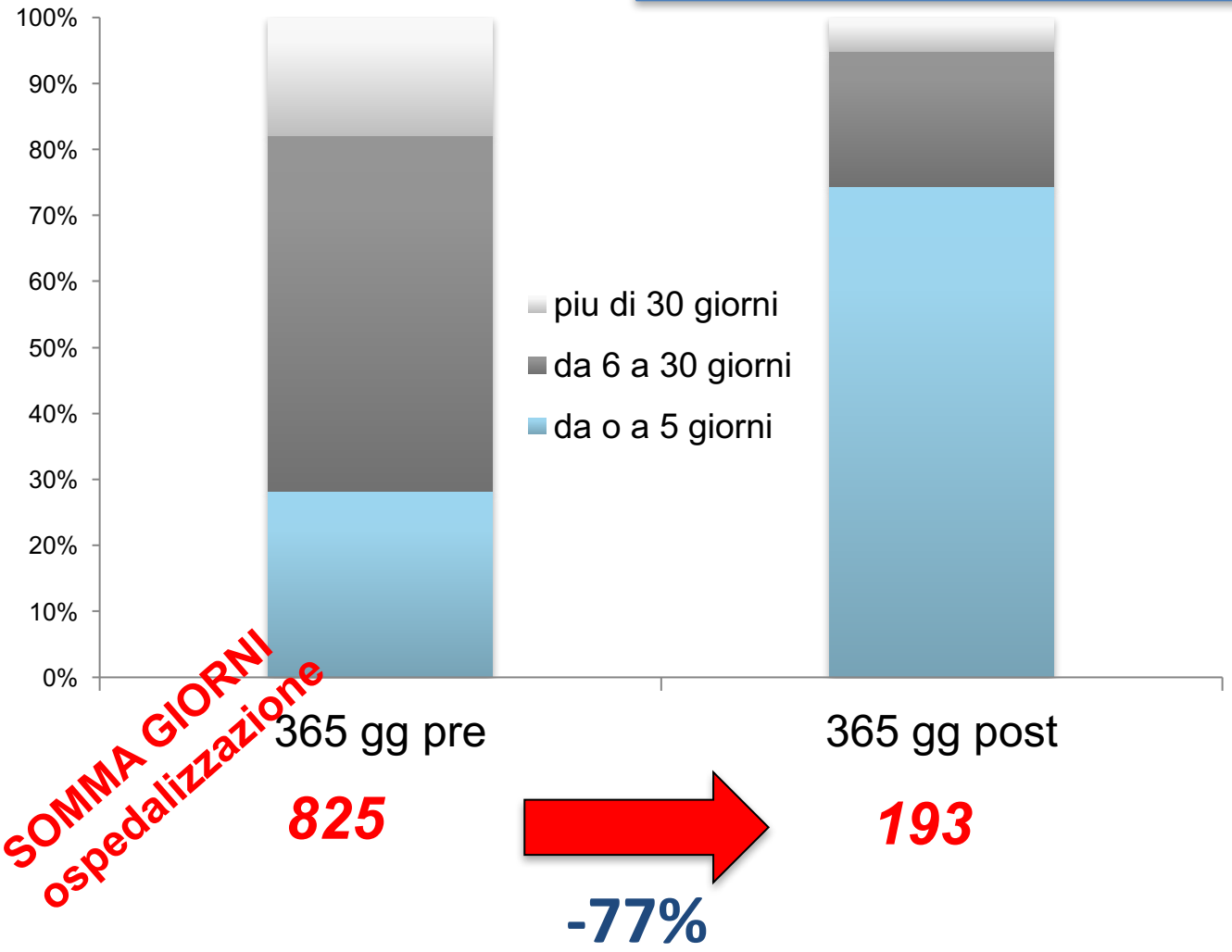
Journal Of Interventional Cardiology
An International Forum for Global Cardiovascular Therapies

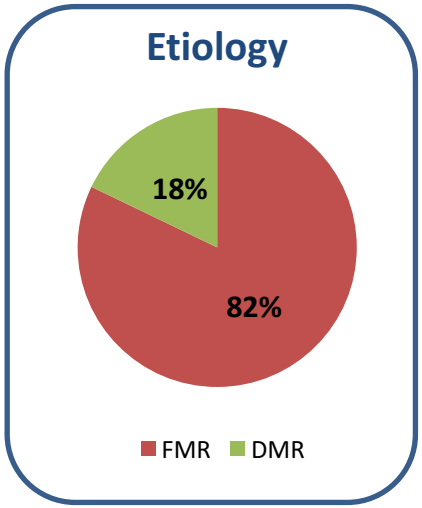
STRUCTURAL HEART DISEASE

Effectiveness of MitraClip Therapy in Patients with Refractory Heart Failure

MARIANNA ADAMO, M.D.,[1] MARCO BARBANTI, M.D.,[2] SALVATORE CURELLO, M.D.,[1] CLAUDIA FIORINA, M.D.,[1] ERMANNA CHIARI, M.D.,[1] GIULIANO CHIZZOLA, M.D.,[1] DAVIDE CAPODANNO, M.D., PH.D.,[2] CORRADO TAMBURINO, M.D., PH.D.,[2] MARCO METRA, M.D.,[1] and FEDERICA ETTORI, M.D.[1]

From the [1]Spedali Civili, Brescia, Italy; and [2]Ferrarotto Hospital, Catania, Italy

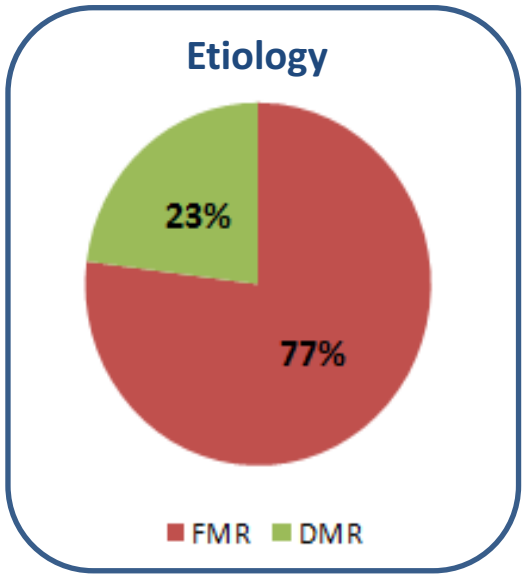




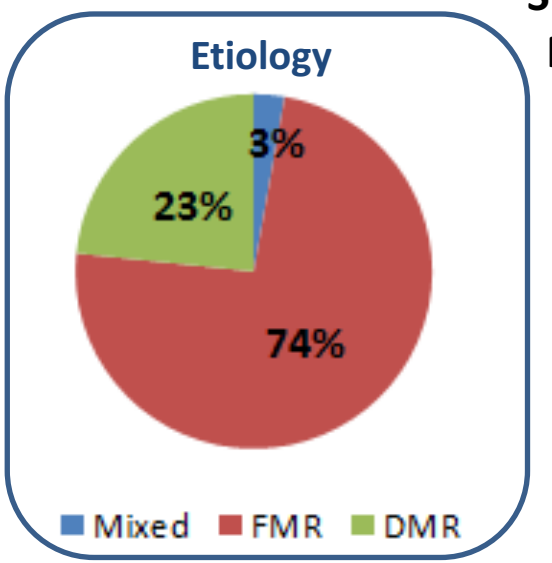
N = 56

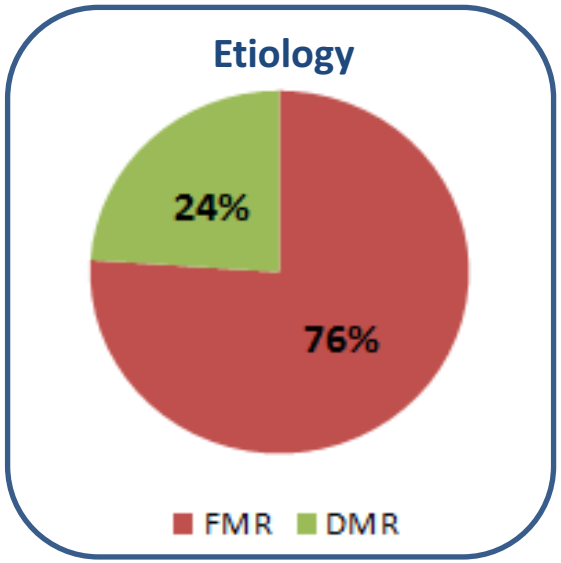
EU Registries in the Real Word: Etiology

Access EU
N = 487



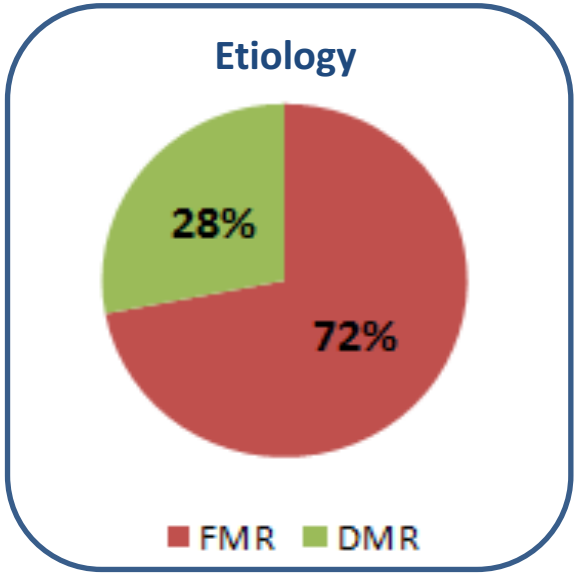
SENTINEL
N = 628





Grasp-IT
N = 304

TRAMI
N = 749

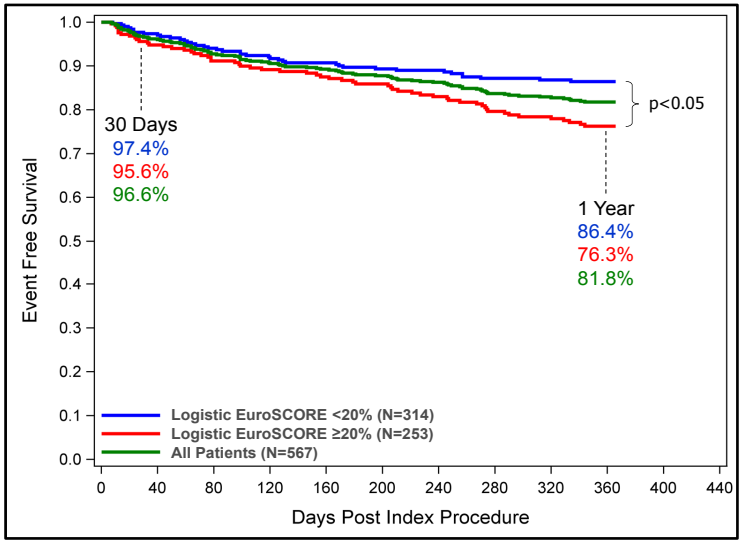


Single-Arm Registries

EU Registries in the Real Word: Outcome

Access EU
N = 487

1-Year Mortality: 18%



Maisano F, et al. J Am Coll Cardiol. 2013;62:1052-61

SENTINEL
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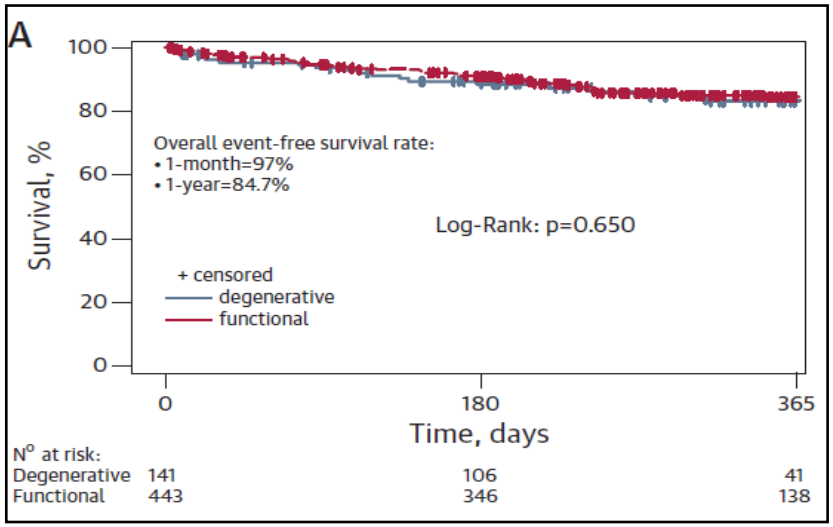
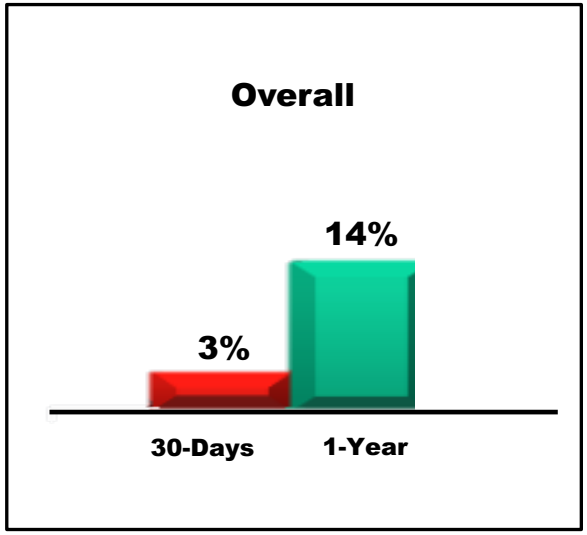
1-Year Mortality: 15%



Di Mario C, et al. J Am Coll Cardiol. 2014;6:875-84



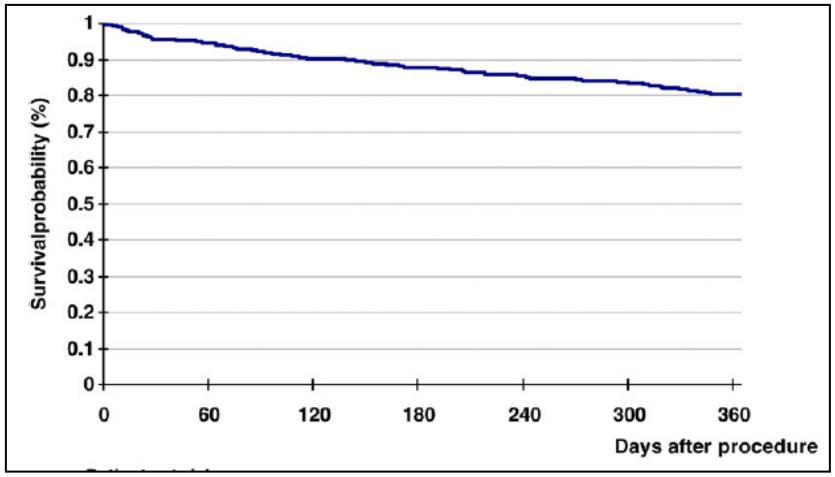
Adamo M, Capodanno D, et al. Am J Cardiol. 2015;115:107-12

TRAMI
N = 749

1-Year Mortality: 20%

Grasp-IT
N = 304

1-Year Mortality: 14%

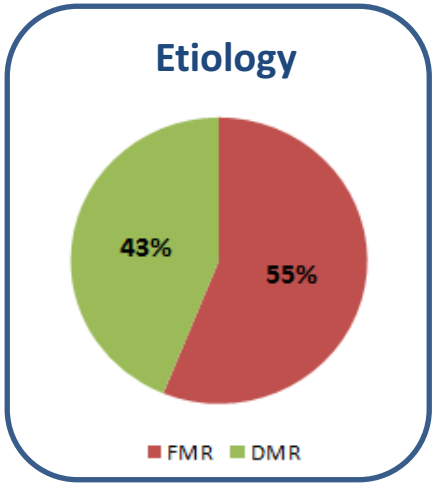


Puls M, et al. European Heart Journal (2016) 37, 703–712

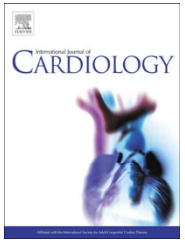
Meta-Analysis

***26** studies including **3821** patient's who were treated with MC*

	Numbers (n)	Weighted mean (%)
Age (years)	3821	73.9
LogEuroScore (%)	2435	25.2
STS Score (%)	899	12.4
MR>3+	3461	90.5
DMR	3515/1518	43.2
FMR	3515/1927	54.8
NYHA class 3–4	3732/3249	87.1
Procedural sucess	3292/3060	92.9



(Meta)-Analysis of Safety and Efficacy Following Edge-to-Edge Mitral Valve Repair Using the MitraClip System



DOROTHEE H.L. BAIL, M.D., PH.D.

From the Competence-Center Quality Assurance, Medical Service of Statutory Healthcare Insurance, Tuebingen and Stuttgart, Germany

Table 2. 30-Day, 6-Month and One-Year Outcome Data

	30-day outcome			6-month outcome			12-month outcome		
	Numbers (n)	Weighted mean (%)	95% CI	Numbers (n)	Weighted mean (%)	95% CI	Numbers (n)	Weighted mean (%)	95% CI
MR<2+	2862/2473	86.4	85.1; 87.6	575 (717)	80.2	77.1; 83.1	676 (839)	80.6	77.7; 83.0
Death (Survival)	3586/102	2.8 (97.2)	2.3; 3.4	129 (1061)	11.9 (88.0)	10.2; 14.3	245 (1405)	17.4 (82.6)	15.1; 19.9
NYHA class 1–2	350/232	66.3	61.1; 71.2	703 (894)	78.6	75.8; 81.3	605 (915)	66.1	62.9; 69.2
MAE all (death excluded)	3551/649	18.3	17.0; 19.6	61 (316)	18.9	15.1; 24.1			
oMVS	3206/112	3.5	2.9; 4.2	27 (607)	4.5	2.9; 6.4	124 (1084)	11.4	9.6; 13.5

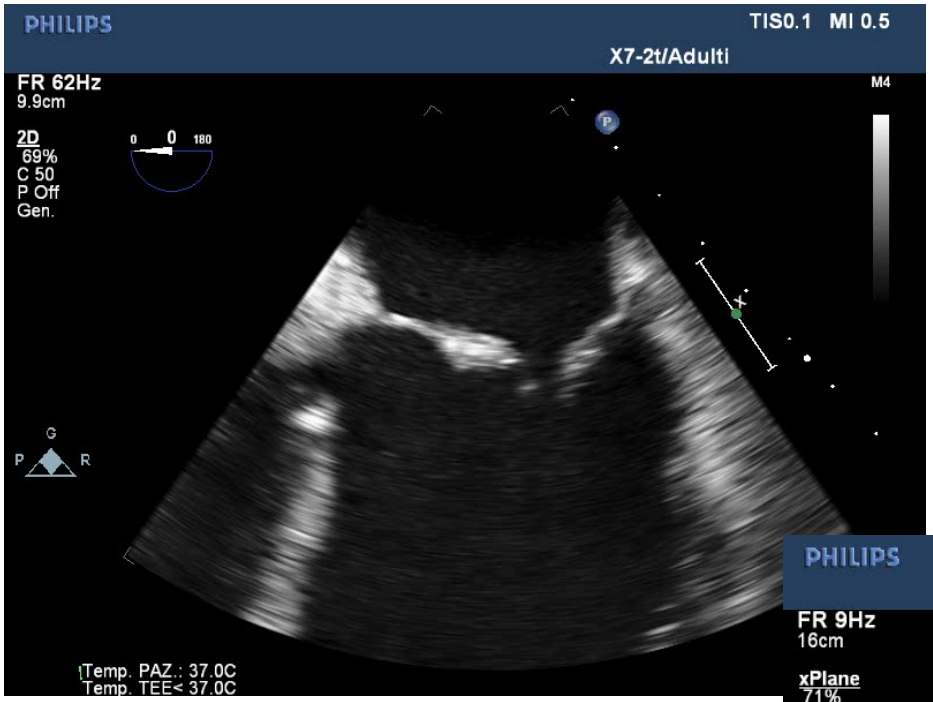
Vol. 28, No. 1, 2015 Journal of Interventional Cardiology 71

"..MC is associated with good short-term success and low mortality. MC is safe and effective for patients with limited surgical options. The results are comparable with open mitral valve repair (oMVR) but patients are markedly older and have a higer risk profile.."

Functional Mitral Regurgitation

Maschio 81 aa
FRC: ipertensione, dislipidemia, DM, ex fumo
PAT ASS: correzione ernia lombare, colecistectomia, BPCO, retinopatia diabetica, IRC IV stadio
AN CARDIO
Arteriopatia periferica con ulcere
Pregresso ictus
CAD con acinesia SIV inferiore e parte inferoposterolaterale → IM da tethering del LPM. FE 30%. Territorio non vitale all'RM → tp medica

FMR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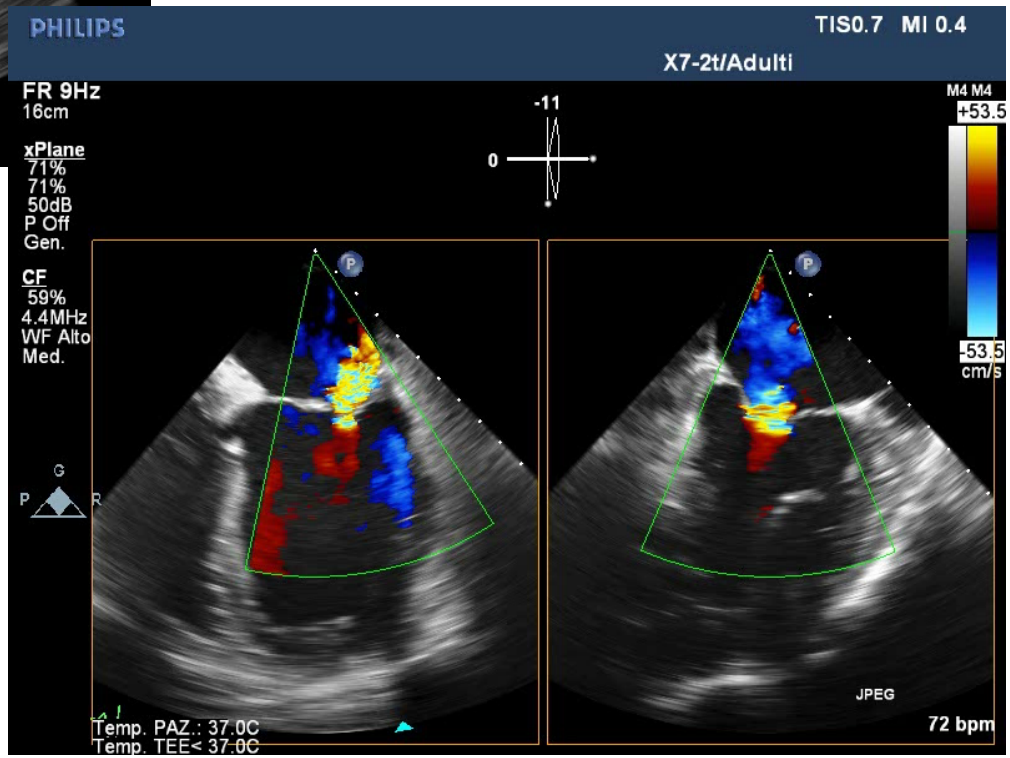
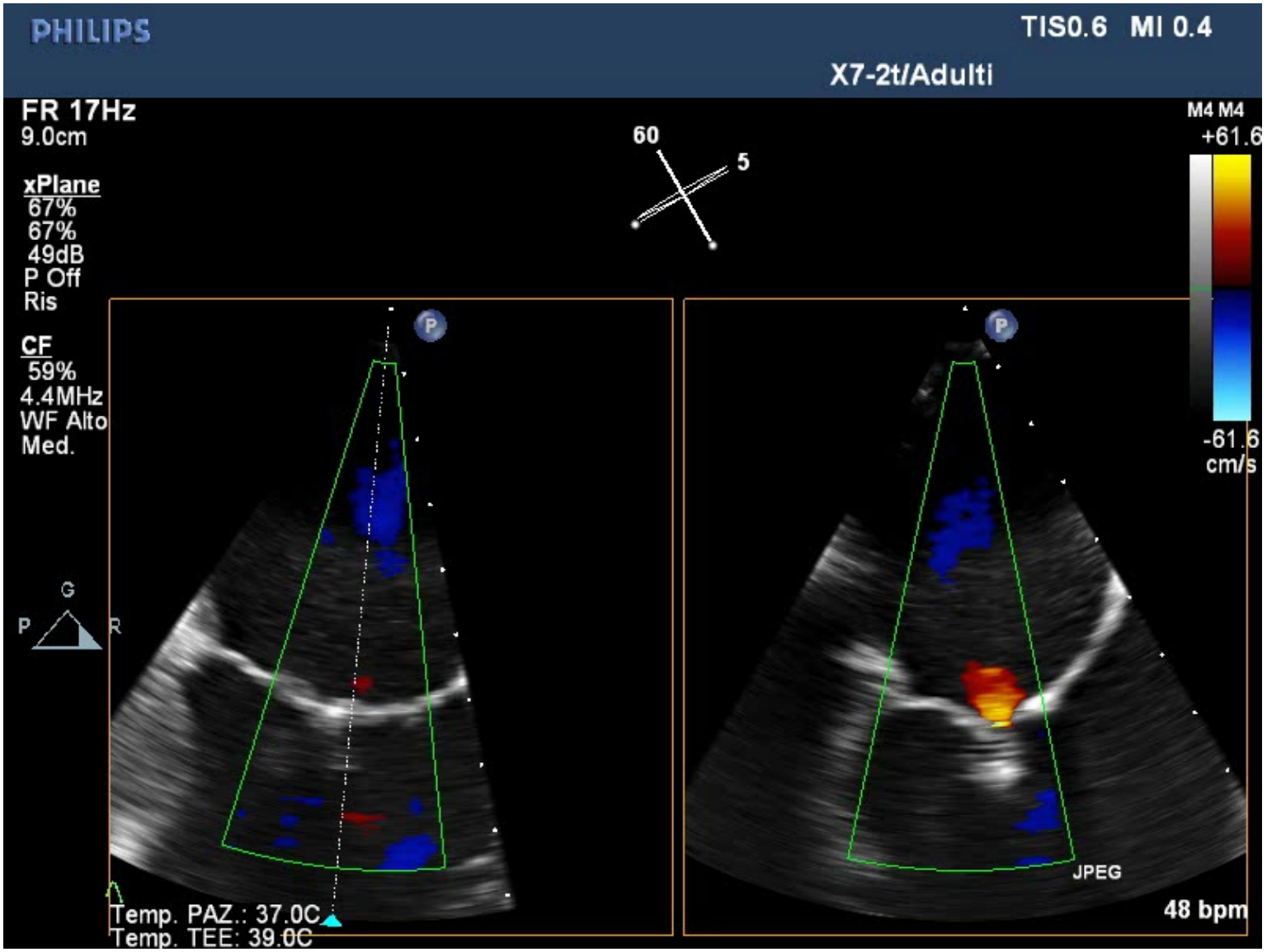
TIS0.1 MI 0.5
X7-2t/Adulti
FR 62Hz
9.9cm
2D
69%
C 50
P Off
Gen.
M4
Temp. PAZ.: 37.0C
Temp. TEE< 37.0C


PHILIPS
TIS0.7 MI 0.4
X7-2t/Adulti
FR 9Hz
16cm
xPlane
71%
71%
50dB
P Off
Gen.
CF
59%
4.4MHz
WF Alto
Med.
M4 M4
+53.5
-53.5
cm/s
JPEG
72 bpm
Temp. PAZ.: 37.0C
Temp. TEE< 37.0C


PHILIPS
TIS0.6 MI 0.4
X7-2t/Adulti
FR 17Hz
9.0cm
xPlane
67%
67%
49dB
P Off
Ris
CF
59%
4.4MHz
WF Alto
Med.
60
5
M4 M4
+61.6
-61.6
cm/s
G
P
R
Temp. PAZ.: 37.0C
Temp. TEE: 39.0C
JPEG
48 bpm

FMR treated

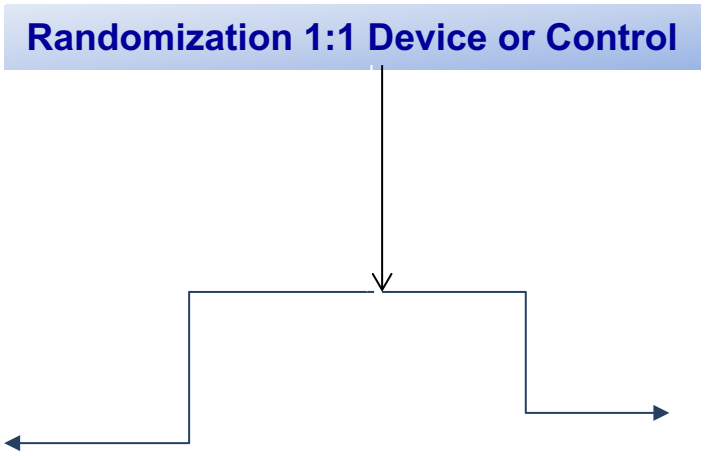
Future of MitraClip Procedure ????

The new Paradigm: Ongoing trials of MitraClip vs OMT

	COAPT	MITRA.FR	RESHAPE-HF-2
Etiology	FMR	FMR (not operable)	FMR
FMR grade	FMR≥3+	FMR>2	FMR≥3+
Number of patients	430	288	380
Randomization	1 to 1	1 to 1	1 to 1
Sites	83	30	40
Countries	US & Canada	France	Europe
NYHA class	≥II	≥II	≥II
Primary efficacy endpoint	Recurrent heart failure hospitalizations	All-cause mortality and unplanned hospitalizations for heart failure	Cardiovascular mortality and unplanned hospitalizations for heart failure

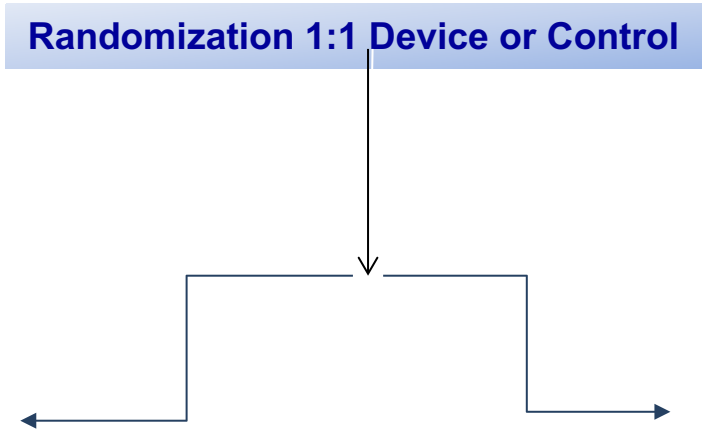
Trials Design

COAPT TRIAL (USA)



DEVICE GROUP	CONTROL GROUP
MitraClip Device + Optimal Standard of Care Therapy (Device)	Optimal Standard of Care Therapy (Control)

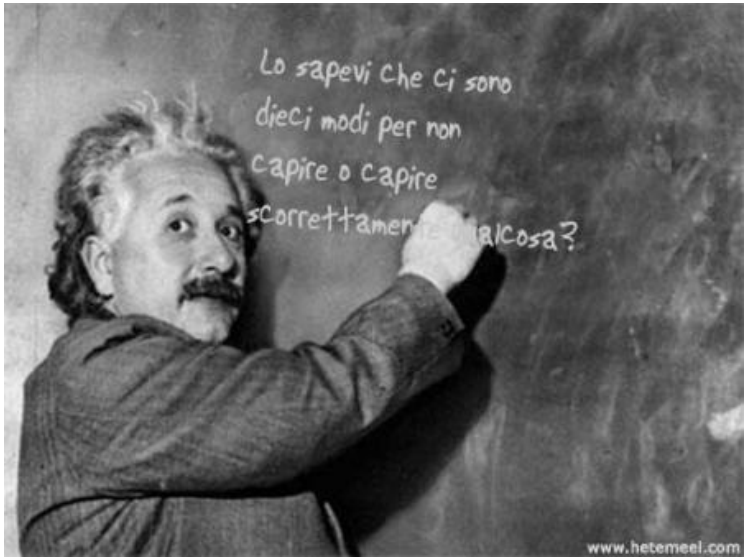
RESHAPE-HF 2 Trial (EU)



DEVICE GROUP	CONTROL GROUP
MitraClip Device + Optimal Standard of Care Therapy (Device)	Optimal Standard of Care Therapy (Control)

… Waiting for RCTs study vs OMT

… In the meanwhile What have we learned?

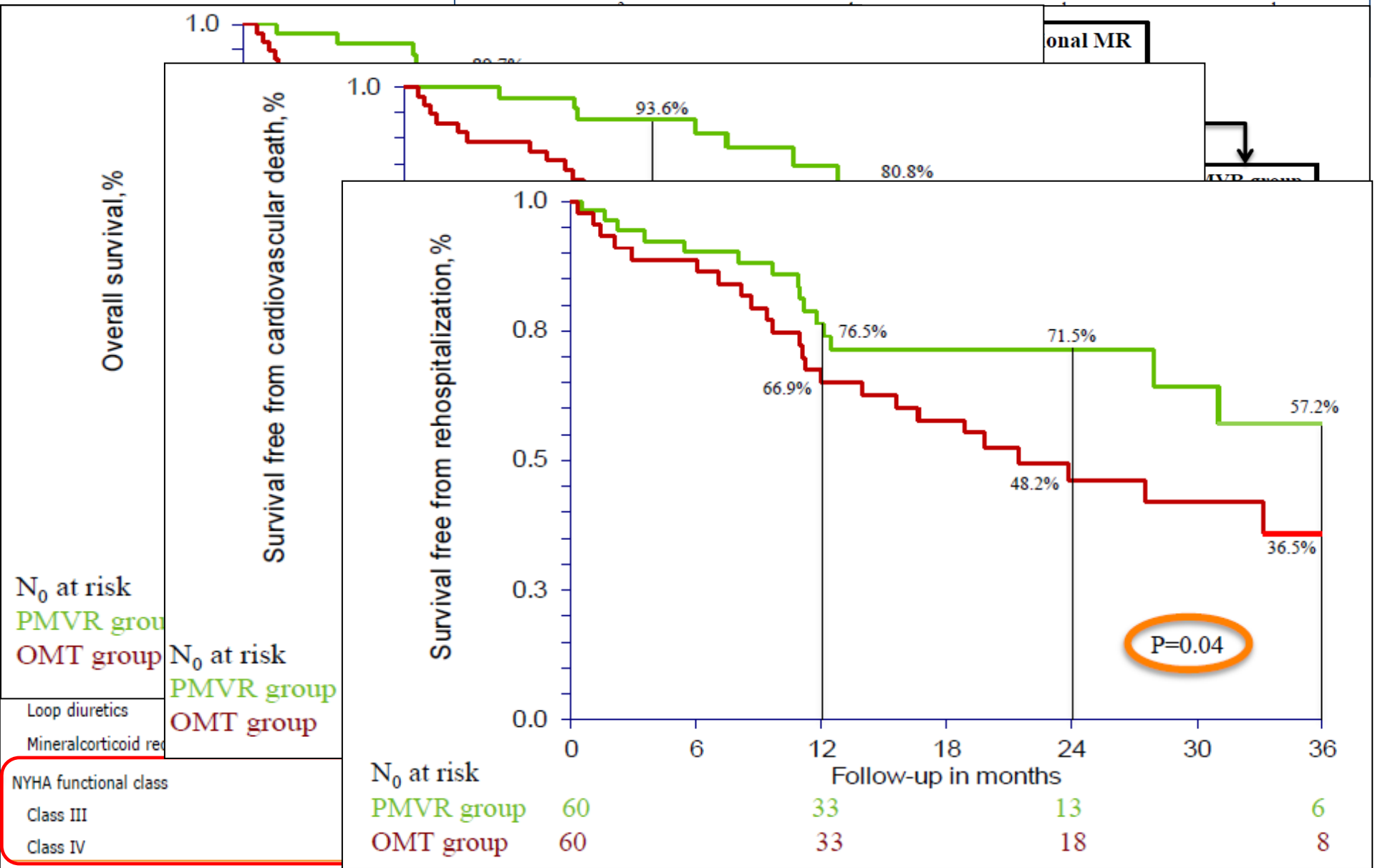


Case-Control Study

Comparison of Percutaneous Mitral Valve Repair Versus Conservative Treatment in Severe Functional Mitral Regurgitation ***2015***

Cristina Giannini, MD, PhD[1], Francesca Fiorelli, MD[1], Marco De Carlo[1], MD, PhD, Fabio

onal MR



Curr Cardiol Rep (2016) 18: 129
DOI 10.1007/s11886-016-0809-7

VALVULAR HEART DISEASE (A WANG, SECTION EDITOR)

Percutaneous Mitral Valve Repair with MitraClip: Patient and Valve Selection for Optimal Outcome

Devdas T. Inderbitzin[1] · Maurizio Taramasso[1] · Fabian Nietlispach[2] · Francesco Maisano[1]

- *Patients needing mitral repair with a low acceptable risk for surgery and a complex anatomy for MitraClip, should preferably undergo conventional surgery.* ***Patients with an unacceptably high risk for surgery might be subjected to a MitraClip therapy.***
- ***A favorable anatomy for MitraClip requires targeting a curative treatment*** *(reduction of MR to less than grade 2+ and no residual lesions at risk for progression)*
- ***While in the case of an extreme and complex anatomy, a palliative approach could be acceptable***
- ***The anatomical boarders are constantly surpassed by a growing expertise in many of specialized high-volume centers*** *and the evolving quality of intra-procedural imaging.*
- ***But where are the limits to predict an unfavorable outcome****? Recent studies identified a number of* ***clinical predictors for an adverse clinical and survival outcome***
- *Identification of clinical restrictions on the other hand indicates the* ***need for a timely intervention at an early stage*** *before deterioration of the myocardial disease*

Case-Control Studies

Predictors of Poor Prognostic Implication

Catheterization and Cardiovascular Interventions 00:00-00 (2015)

Original Studies

Long-Term Survival and Preprocedural Predictors of Mortality in High Surgical Risk Patients Undergoing Percutaneous Mitral Valve Repair

Andreas S. Triantafyllis, MD, PhD, Friso Kortlandt, MD, Annelies L.M. Bakker, MD, Martin J. Swaans, MD, Frank D. Eefting, MD, Jan A.S. van der Heyden,* MD, PhD, Martijn C. Post, MD, PhD, and Benno W.J.M. Rensing, MD, PhD

TABLE VII. Preprocedural Predictors of Long-Term Cardiac Mortality in Multivariate Analysis

	Cardiac death				
	Yes	No	HR	CI 95%	*P*
Number	29	107			
Age (yrs)	77.2±7.0	73.7±9.9	1.07	1.02-1.13	**0.011**
NYHA	3.4±0.6	3.0±0.6	2.07	1.02-4.20	**0.045**
Log-NTproBNP	8.3±1.2	7.7±1.2	1.52	1.07-2.15	**0.018**

CI: confidence interval; HR: hazards ratio; log-NTproBNP: log-N-terminal-pro-brain-natriuretic-peptide; NYHA: New York Heart Association. Bold *P* values imply statistical significance.

JGU UNIVERSITÄTSmedizin. 2. Medizinische Klinik MAINZ

Patient selection criteria and midterm clinical outcome for MitraClip therapy in patients with severe mitral regurgitation and severe congestive heart failure

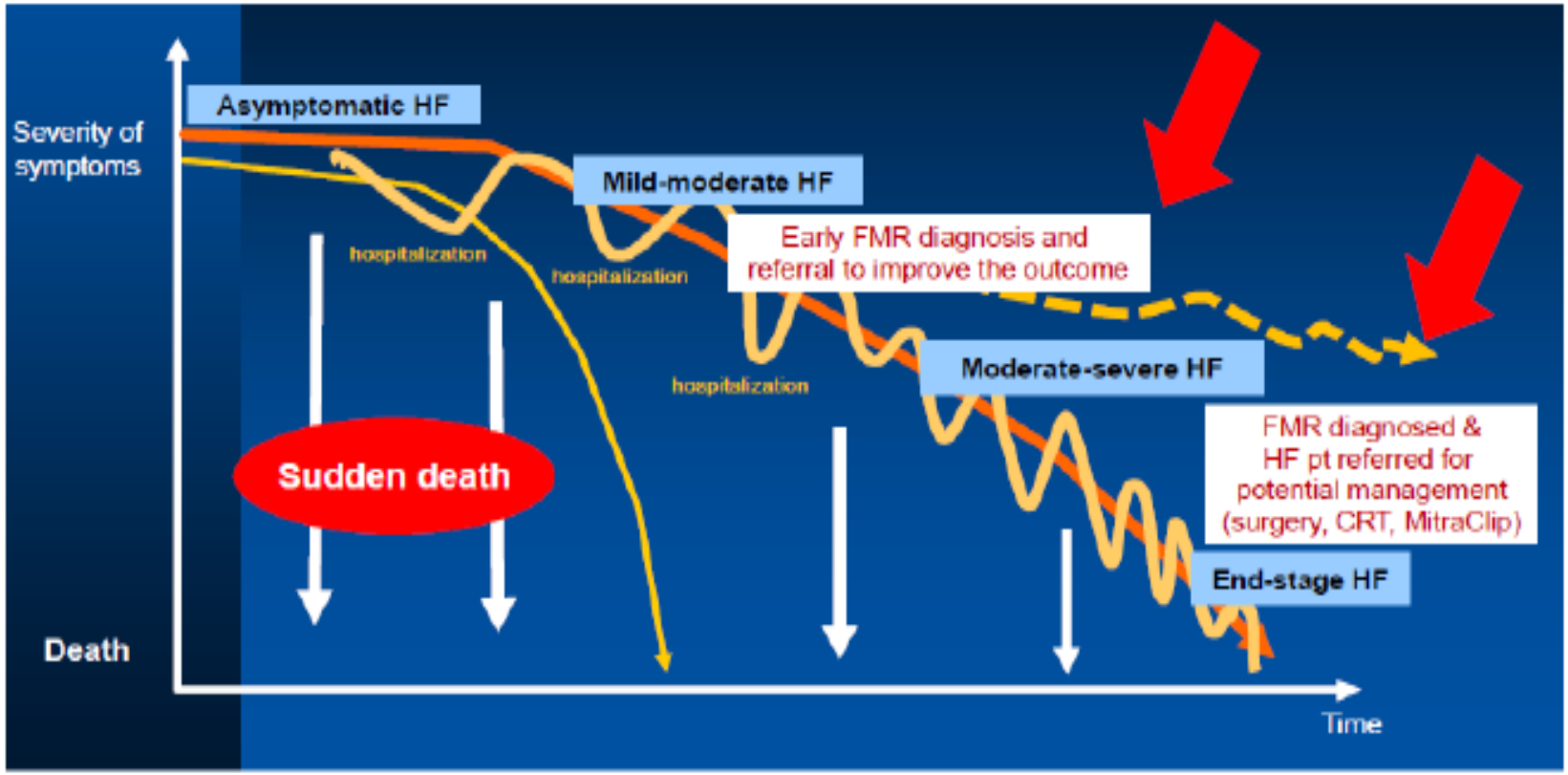
Michael Nickenig*, Thomas Schau, Maren Schnegg, Martin Seifert, Frank Hölschermann, Jürgen Meyhöfer, and Christian Butter

Table 4 Predictors of the combined event (primary endpoint: combination of all-cause mortality, left ventricular assist device implantation, mitral valve surgery, unsuccessful implantation) in univariate and multivariate analysis (Cox model)

Parameter	Univariate analysis		Multivariate analysis: optimized model	
	HR (95% CI)	P-value	HR (95% CI)	P-value
NT-proBNP >10 000 pg/mL	4.6 (2.6–8.2)	<0.001	3.5 (1.9–6.7)	<0.001
Age >80 years	1.8 (1.0–3.3)	0.046	2.2 (1.2–4.2)	0.008
Serum creatinine >150 mmol/L	2.4 (1.4–4.3)	0.002		
NYHA class IV	2.1(1.2–3.7)	0.008	1.7(1.0–3.2)	0.049
TAPSE <15 mm	3.2 (1.8–5.6)	<0.001	1.9(1.0–3.6)	0.038
TR grade >2+	2.0 (1.0–4.0)	0.052		

CI, confidence interval; HR, hazard ratio; TAPSE, tricuspid annular plane systolic excursion; TR, tricuspid regurgitation.

WHEN refer to PMVR: Timing is crucial



Piotr Ponikowski, MD, PhD, FESC
Medical University, Centre for Heart Disease Clinical Military Hospita ***HFA Athens 2014***

Thank you for your attention !

Single-Arm Registries

Predictors of Poor Prognostic Implication

European Heart Journal (2016) 37, 703–712
doi:10.1093/eurheartj/ehv627

CLINICAL RESEARCH
Valvular heart disease

One-year outcomes and predictors of mortality after MitraClip therapy in contemporary clinical practice: results from the German transcatheter mitral valve interventions registry

**Miriam Puls[1]*, Edith Lubos[2], Peter Boekstegers[3], Ralph Stephan von E
Taoufik Ouarrak[5], Christian Butter[6], Christine S. Zuern[7], Raffi Bekere
Horst Sievert[9], Georg Nickenig[10], Holger Eggebrecht[11], Jochen Senge
and Wolfgang Schillinger[1,12]†**

[1]Herzzentrum, Georg-August-Universität Göttingen, Göttingen, Germany; [2]Universitäres Herzzentrum Eppendorf Hamburg, Hamburg, Germany; [3]Klin
Angiologie), Siegburg, Germany; [4]Universitätsmedizin Mainz, 2. Med. Klinik, Mainz, Germany; [5]Stiftung Institut für Herzinfarktforschung, Ludwigshafer
Brandenburg, Bernau, Germany; [7]Universitätsklinikum Tübingen, Tübingen, Germany; [8]Universitätsklinikum Heidelberg, Heidelberg, Germany; [9]Card
Frankfurt St. Katharinen, Frankfurt am Main, Germany; [10]Universitätsklinikum Bonn (Med. Klinik und Poliklinik II), Bonn, Germany; [11]Cardioangiologisc
Frankfurt am Main, Germany; and [12]Helios Albert-Schweitzer-Klinik Northeim, Northeim, Germany

Received 12 May 2015; revised 28 September 2015; accepted 28 October 2015; online publish-ahead-of-print 27 November 2015

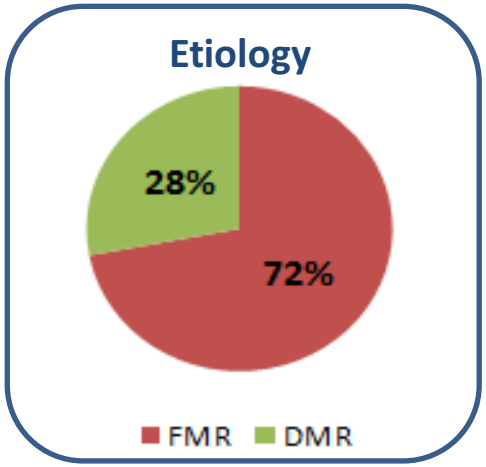


Table 4 Predictors of 1-year mortality in the transcatheter mitral valve interventions registry cohort

	Multivariable analysis (Cox regression model)	
	HR (95% CI)	P
Age >75 years	1.29 (0.90–1.87)	0.16
Female gender	1.13 (0.78–1.64)	0.53
NYHA IV	1.62 (1.10–2.40)	0.02
Anaemia	2.44 (1.16–5.12)	0.02
Previous aortic valve intervention	2.12(1.32–3.41)	0.002
Creatinine ≥1.5 mg/dL	1.77 (1.24–2.54)	0.002
Peripheral artery disease	2.12 (1.41–3.20)	0.0003
LVEF <30%	1.58 (1.10–2.31)	0.01
Severe tricuspid regurgitation	1.84 (1.23–2.77)	0.003
Procedural failure[a]	4.36 (2.37–8.02)	<0.0001

[a]Operator-reported failure, conversion to surgery, abortion of procedure or severe residual mitral regurgitation.

Case-Control Study

The Impact of growing experience

Catheterization and Cardiovascular Interventions 00:00–00 (2016)

Influence of Experience on Procedure Steps, Safety, and Functional Results in Edge to Edge Mitral Valve Repair—A Single Center Study

Karsten Hamm,[1*] MD, Michael Zacher,[2] MD, MS, Martina Hautmann,[1] MD, Frank Gietzen,[1] MD, Philipp Halbfass,[1] MD, Sebastian Kerber,[1] MD, Anno Diegeler,[2] MD, Bernhard Schieffer,[3] MD, and and Sebastian Barth,[1] MD

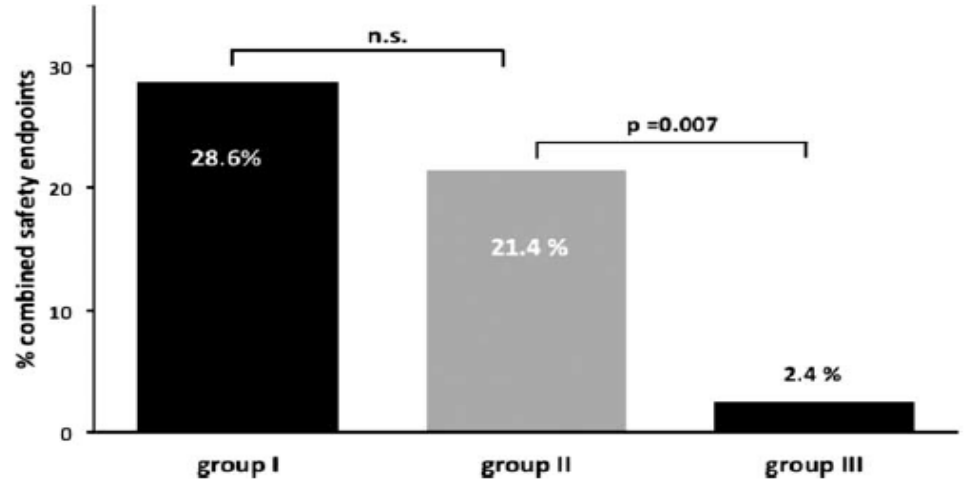


Fig. 2. Frequency of combined safety end points of mitral valve or clip-related surgery, necessity of ASD closure and procedural failure in groups I–III.

Between 2011 and 2016, 126 consecutive patients were were treated and grouped in 42 consecutive patients each for further analysis in three groups

	Group I ($n=42$)	Group II ($n=42$)	Group III ($n=42$)
Male sex (n)	33	30	26
Age (years)	73.6 ± 8.7	74.9 ± 8.2	75.7 ± 9.1
NYHA III/IV (n)	38	38	37
BMI (kg/m^2)	27.0 ± 4.7	27.0 ± 5.1	25.2 ± 5.2
Diabetes (n)	14	14	17
Hypertension (n)	34	31	35
AF (n)	34	29	19
Ischemic CMP (n)	25	26	24
Dilative CMP (n)	17	14	16
EF< 30% (n)	21	22	21
Frailty (n)	17	13	8
ICD/bivent. ICD (n)	13/9	8/10	7/3
GFR (ml/min)	40.9 ± 18.4	51.0 ± 21.4	49.9 ± 23.7
Prior heart surgery (n)	13	8	12
Prior stroke (n)	3	3	4
Euro Score log.	38.0 ± 21.2	32 ± 16.9	37.8 ± 18.7
Euro Score add.	12.3 ± 3.2	12.0 ± 3.2	12.6 ± 2.9

		Group II	Group III
Procedure interval (days)	13.6 ± 14.7	15.2 ± 12.5	11.5 ± 12.1
Total procedure time (min)	221 ± 72	167 ± 74	144 ± 68
Time to transseptal puncture (min)	22 ± 15	13 ± 10	13 ± 13
Time needed for clip 1 (min)	106 ± 49	64 ± 30	50 ± 21
Time needed for clip 2 (min)	69 ± 27	42 ± 15	33 ± 11
Device time (min)	116 ± 57	71 ± 41	48 ± 30
Fluoroscopy time (min)	17.5 ± 8.5	15.5 ± 8.2	11.1 ± 8.1

Case-Control Study

Survival of Transcatheter Mitral Valve Repair Compared With Surgical and Conservative Treatment in High-Surgical-Risk Patients

2014

Martin J. Swaans, MD,* Annelies L. M. Bakker, MD,* Arash Alipour, MD, PhD,* Martijn C. Post, MD, PhD,* Johannes C. Kelder, MD, PhD,* Thom L. de Kroon, MD,† Frank D. Eefting, MD,* Benno J. W. M. Rensing, MD, PhD,*

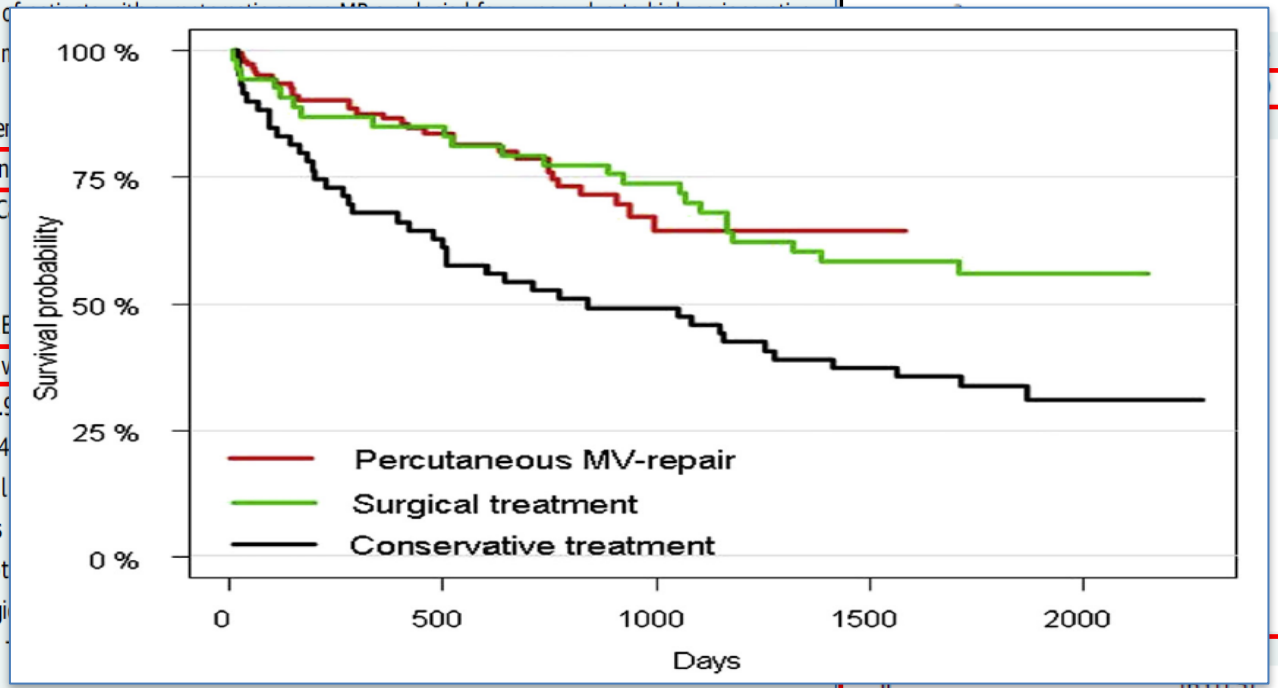
OBJECTIVES The goal of this study was to compare survival between transcatheter mitral valve (MV) repair using MitraClip system (Abbott Vascular, Santa Clara, California), MV-surgery, and conservative treatment in high-surgical-risk patients symptomatic with severe mitral valve regurgitation (MR).

BACKGROUND Up to 50% o… risk. Transcatheter MV repair r…

METHODS Consecutive patie… (n = 53) and conservatively (n… logistic European System for C… as judged by the heart team.

RESULTS The log EuroSCORE… (14.2 ± 8.9%) and conservativ… higher in surgical patients (43.9… and conservatively treated (34… groups showed similar survival… survived. The same trend was… controlling for risk factors, bot… to 0.78, p = 0.006) and surgi… conservatively treated group. … 2.16, p = 0.430).

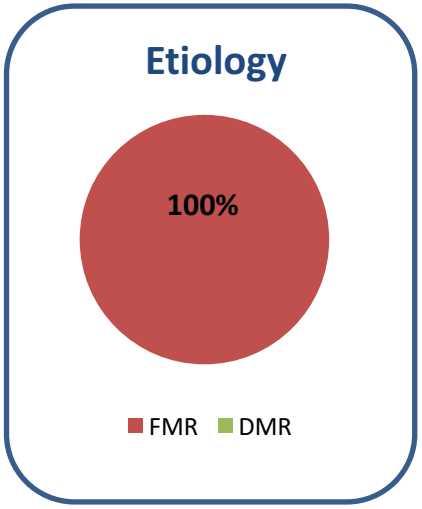
CONCLUSIONS Despite a higher log EuroSCORE, high-surgical-risk patients with symptomatic severe MR treated with transcatheter MV repair show similar survival rates compared with surgically treated patients, with both displaying survival benefit compared with conservative treatment. (J Am Coll Cardiol Intv 2014;7:875-81) © 2014 by the American College of Cardiology Foundation.



Characteristic	MitraClip	High-Risk Surgery	Conservative Treatment
No.	139	53	59
Age, yrs	74.6 ± 9.4	70.2 ± 9.5	71.7 ± 9.6
Male, %	94 (67.6)	27 (50.9)	32 (54.2)
		26.7 ± 5.3	26.5 ± 4.5
		43.9 ± 14.4	34.5 ± 16.5
		14.2 ± 8.9	18.7 ± 13.2
		28 (52.8)	25 (42.4)
		10 (18.9)	17 (28.8)
		27 (50.9)	24 (40.7)
		15 (28.3)	19 (32.2)
		28 (52.8)	45 (76.3)
		13 (24.5)	25 (42.4)
		5 (9.4)	9 (15.3)
		9 (17.0)	11 (18.6)
		1 (1.9)	2 (3.4)
		9 (17.0)	18 (30.5)
		11 (20.8)	14 (23.7)
		28 (52.8)	26 (44.1)
		14 (26.4)	19 (32.2)
II		6 (11.3)	8 (13.6)
III	91 (65.5)	38 (71.7)	35 (59.3)
IV	32 (23.0)	9 (17.0)	16 (27.1)
Etiology			
FMR	107 (77.0)	31 (58.5)	48 (81.3)
DMR	25 (18.0)	17 (32.1)	4 (6.8)
Mixed	7 (5.0)	5 (9.4)	7 (11.9)

Cases Series

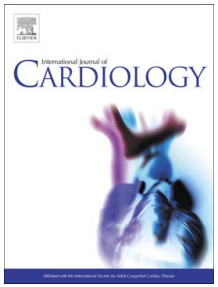
"..The present study describes the results of PMVR with the MitraClip device in ***an extreme setting of patients with severe FMR and CHF*** *non-responders to optimal medical therapy and CRT.."*

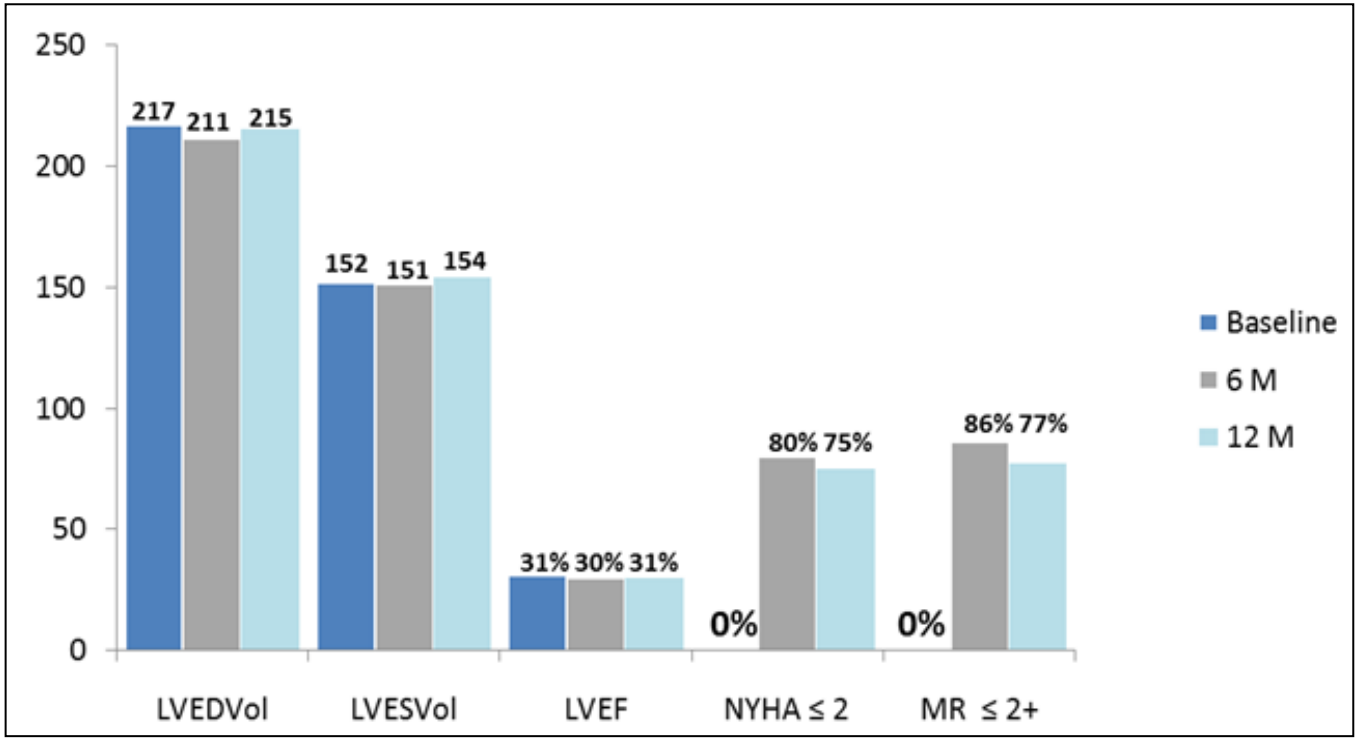


N = 75

Percutaneous mitral valve repair: the last chance for symptoms improvement in advanced refractory chronic heart failure ?

Alessandra Berardini, MD[1], PhD, Elena Biagini, MD[2], PhD, Francesco Saia, MD, PhD[3], Davide Stolfo, MD[4], Mario Previtali, MD[5], Francesco Grigioni, MD[6], Bruno Pinamonti, MD[7], Gabriele Crimi, MD[8], Alessandro Salvi, MD[9], Maurizio Ferrario, MD[10], Antonio De Luca, MD[11], Fabrizio Gazzoli, MD[12], Maria Letizia Bacchi Reggiani, MSc[13], Claudia Raineri, MD[14], Gianfranco Sinagra, MD[15], Claudio Rapezzi, MD, PhD[16]





".. In extreme risk HF patients with FMR, PMVR improved symptoms and reduced re-hospitalization and pro-BNP levels despite the lack of LV reverse remodeling.."

Expert Opinion

The MitraClip System: an Italian Consensus Statement

Journal of Cardiovascular Medicine, 15 (3) p.173-188, 2014

Transcatheter Treatment of Chronic Mitral Regurgitation with the MitraClip System: an Italian Consensus Statement

Journal of Cardiovascular Medicine, 15 (3) p.173-188, 2014

«…Le recenti Linee Guida della Società Europea di Cardiologia e della Associazione Europea di Chirurgia Cardio-Toracica, ***considerano la MitraClip come una potenziale opzione terapeutica in pazienti selezionati affetti da rigurgito mitralico severo sintomatico con alto rischio chirurgico*** *o inoperabili*[52]*…»*

«…Il processo di selezione per l'impianto di MitraClip deve essere riservato ad un centro.. che includa i cardiologi interventisti, i cardiochirurghi, gli ecocardiografisti, gli anestesisti, e gli specialisti dello scompenso cardiaco (Heart Team)…»

*«…****In candidati selezionati, la procedura MitraClip appare associata ad un miglioramento della qualità di vita, ad una possibilità di rimodellamento inverso del ventricolo sinistro, ad un aumento della capacità funzionale, e a una riduzione di ospedalizzazioni****. Pertanto, la terapia MitraClip può giocare un ruolo significativo nel campo della terapia non farmacologica dello scompenso cardiaco e della malattia della valvola mitrale…»*

52 Vahanian A, Alfieri O, Andreotti F, et al. Guidelines on the management of valvular heart disease (version 2012): the Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J 2012; 33:2451–2496.

Approvazioni

Approvazione FDA (Food and Drug Administration USA)

- **25 Ottobre 2013**: officializzazione del **FDA Approval per MitraClip** con lancio immediato negli US per tutti I pazienti con rigurgito mitralico degenerativo giudicati ad alto rischio chirurgico[1]

Approvazione Sistema Sanitario Canadese

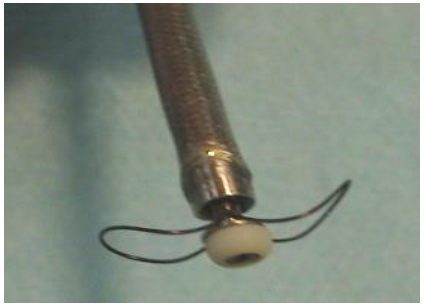
- **30 Aprile 2014**: officializzazione **dell'Approval del Sistema Sanitario Canadese per MitraClip** per tutti i pazienti DMR ad alto rischio chirurgico dopo valutazione di un team di cardiologi e di un cardiochirurgo[3]

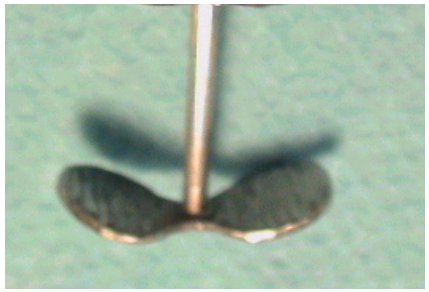
[1,3] Comunicati stampa disponibili sul sito www.abbott.com. [2] E-print al link: http://www.medengine.com/Redeem/5232C1401E8C98DE

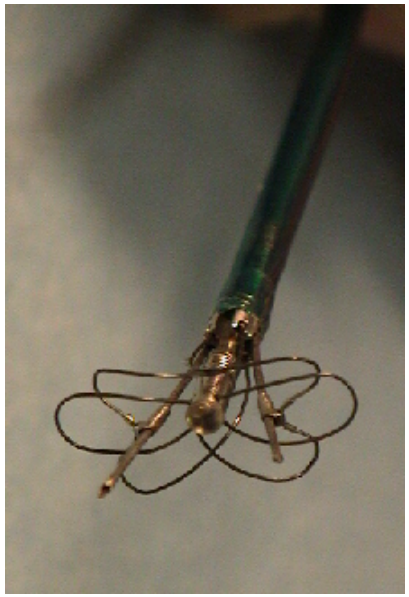
Abbott Vascular

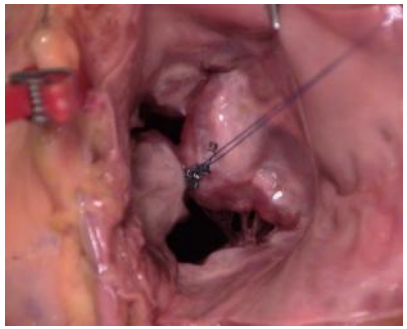
MitraClip Design Evolution

Suture Based Designs

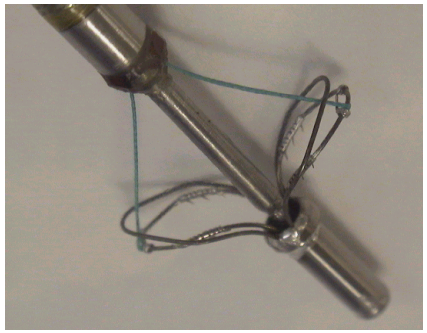


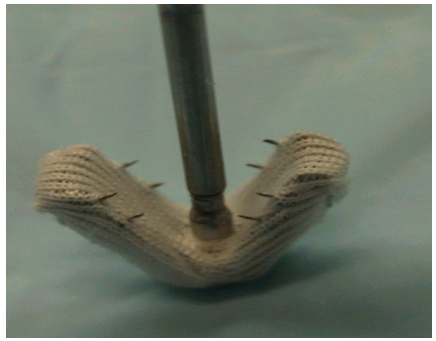


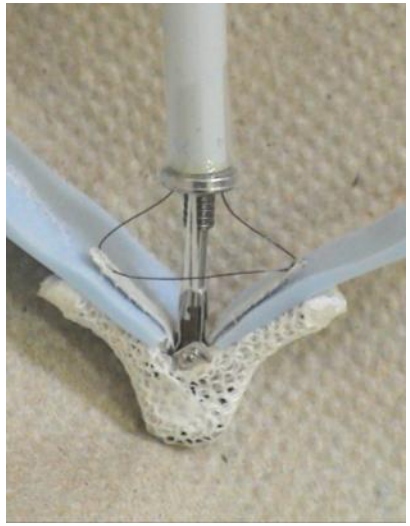




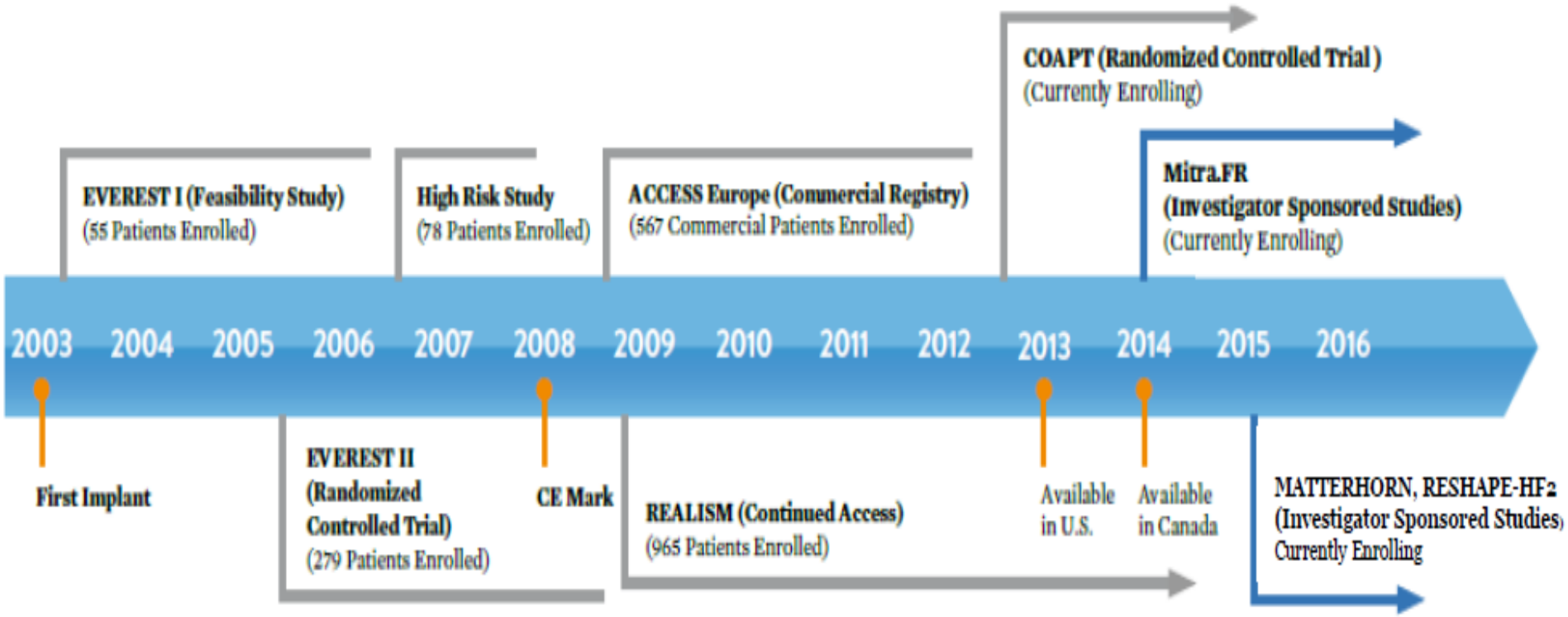
Clip Based Designs







MitraClip Clinical Experience



ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

- The ESC represents 51 countries with a population of 900 million, and there are at least ***15 million*** patients with HF.
- The prevalence of HF is between 2 and 3% and rises sharply at 75 years of age, so the prevalence in 70- to 80-year-old people is between 10 and 20%.