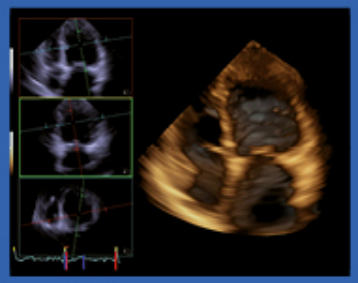
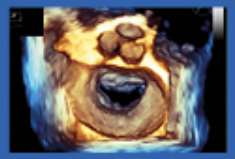
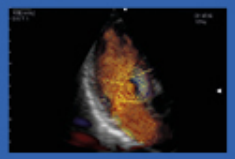


EuroValve
March 27 - 28, 2015

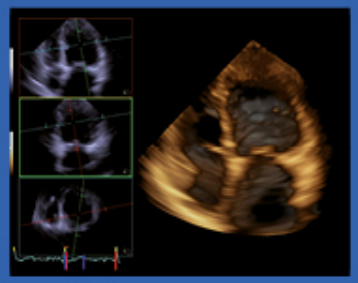
PHT following surgery for valvular heart disease

Rocio Hinojar
University Hospital Ramon y Cajal,
Madrid, Spain



www.eurovalvecongress.com



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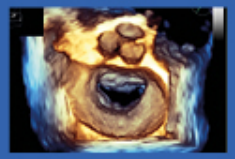
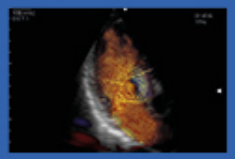
March 27 - 28, 2015

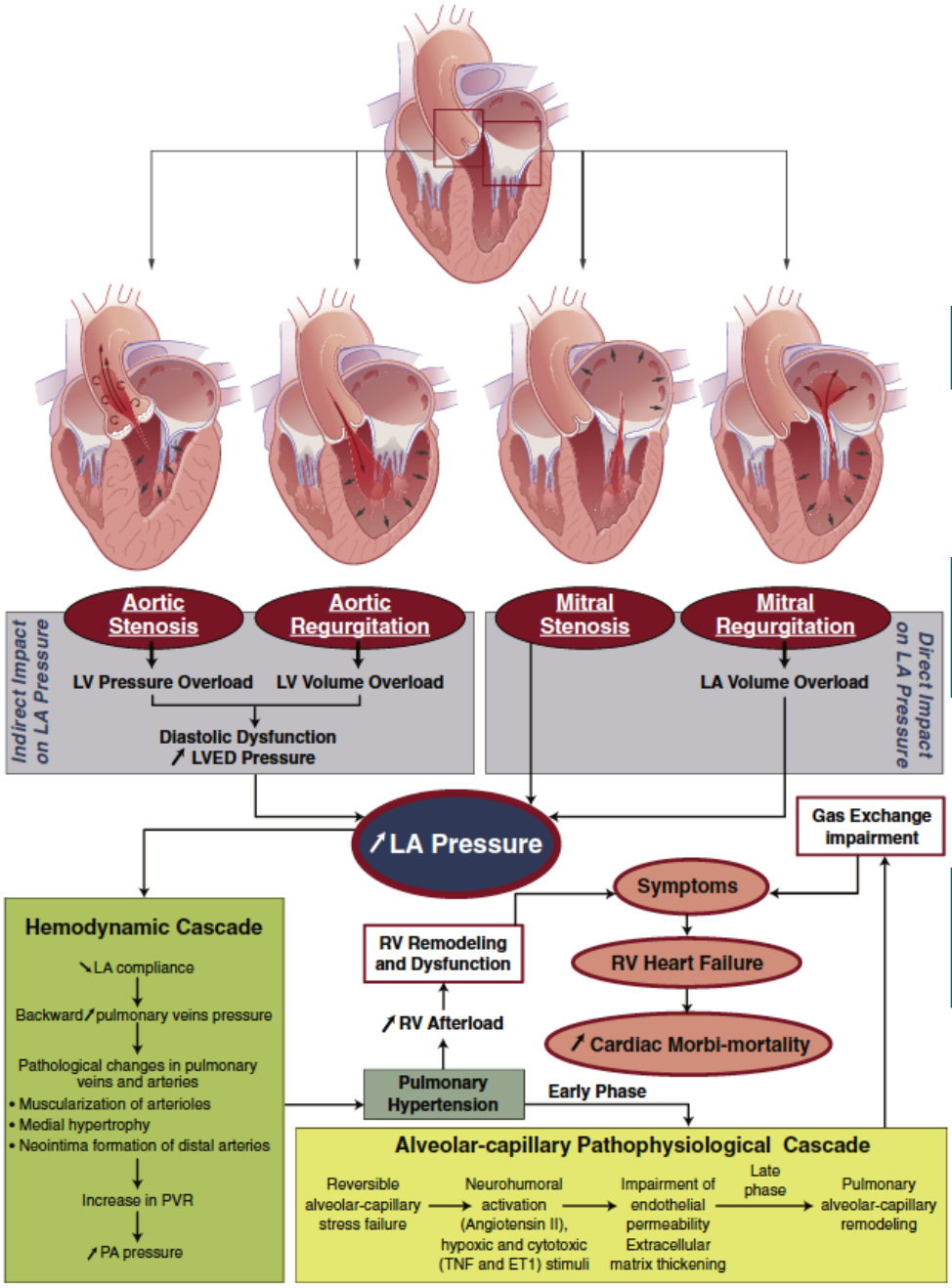
Faculty disclosure

Rocio Hinojar, MD

I have **no financial relationships** to disclose.





Passive venous transmission

↓

Reversible pulmonary arterial vasoconstriction

↓

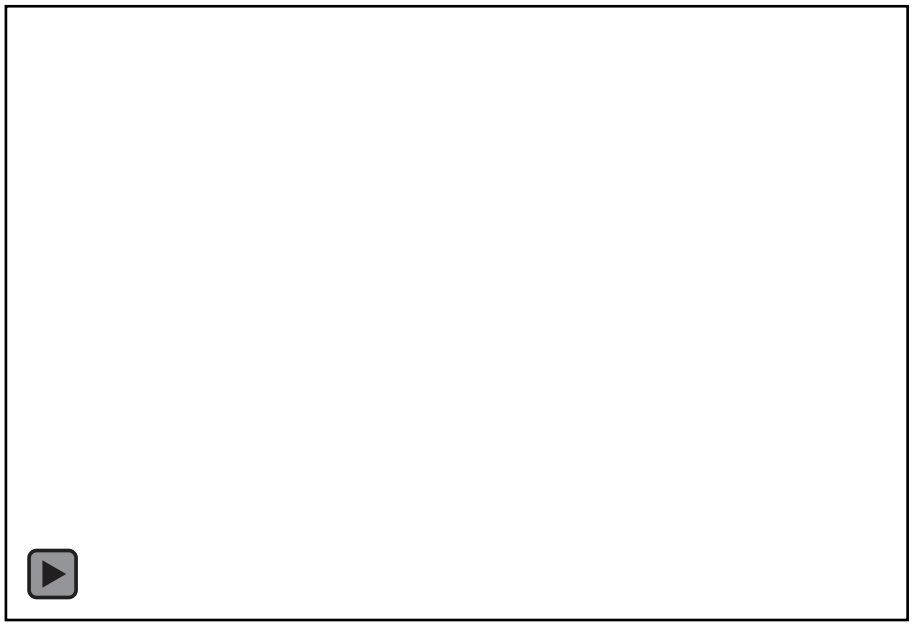
Fixed pulmonary vascular remodelling

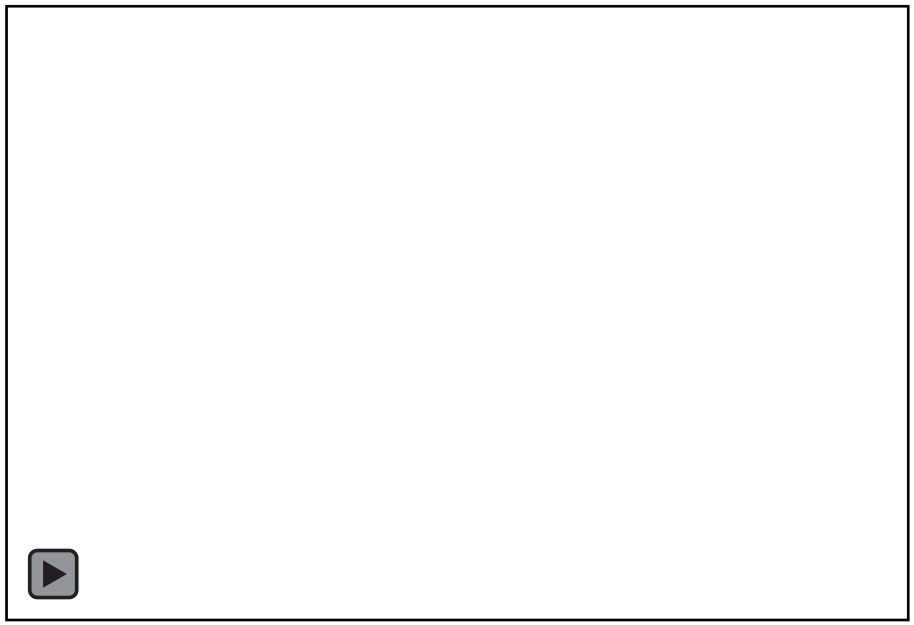
Magne J. JACC CVI 2015 Jan

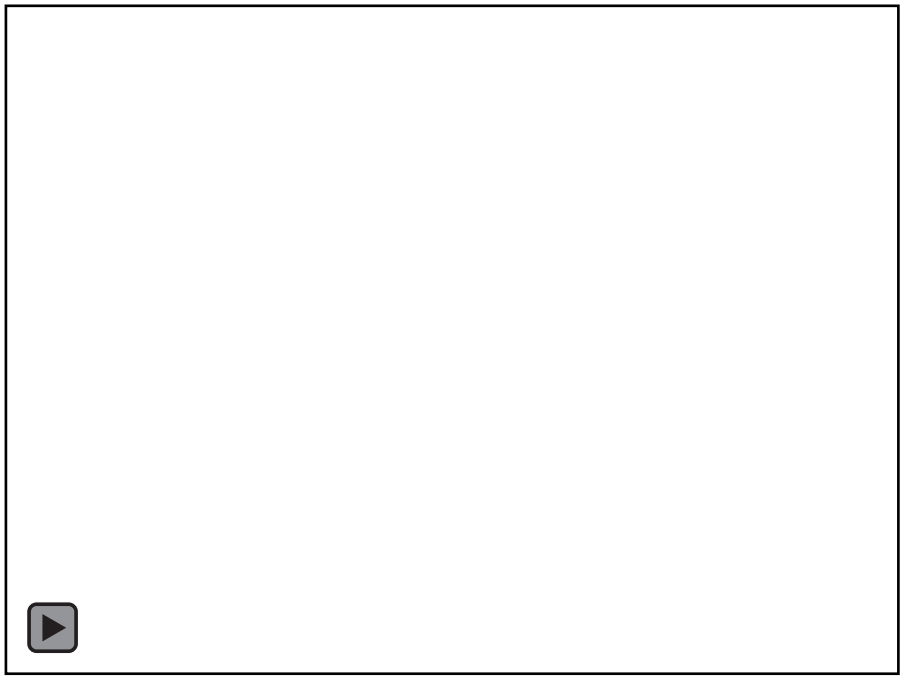
TABLE 2. Hemodynamic and Angiographic Changes After Valve Replacement

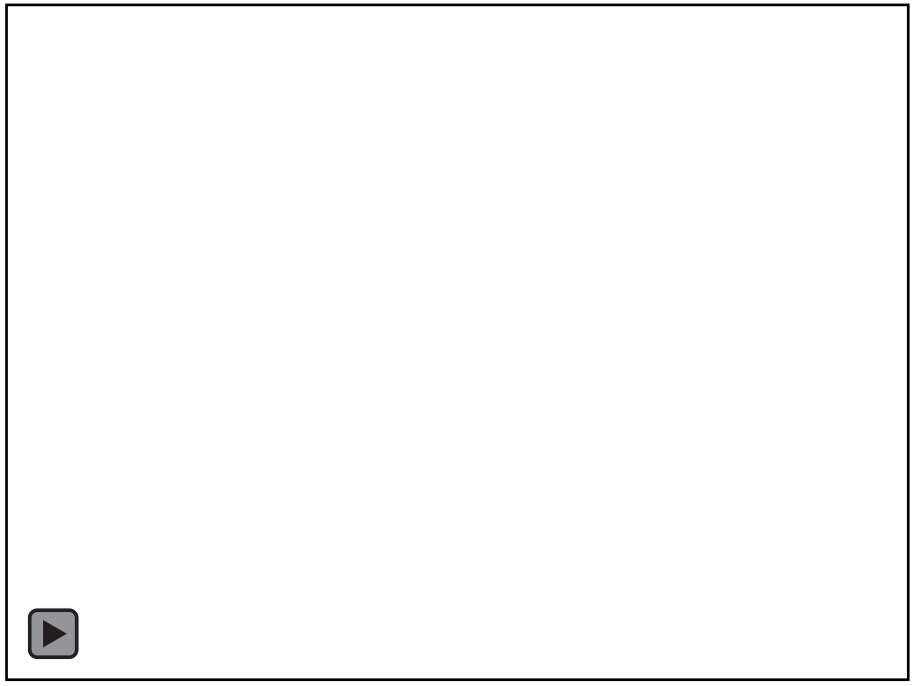
	MS		MS/MR		MR	
Variable	Preop	Postop	Preop	Postop	Preop	Postop
SPAP (mm Hg)	54±24	42±22*	47±18	36±15*	43±16	33±13†
Mean PAP (mm Hg)	36±15	28±14†	30±12	25±11	29±11	22±9†
LVEDP (mm Hg)	11±5	12±6	14±6	13±7	18±8	12±6†
Heart rate (beats/min)	80±19	81±15	77±17	74±12	79±15	74±14
CI (l/min/m^2)	2.1±0.5	2.3±0.6	2.3±0.6	2.3±0.5	2.5±1.0	2.7±0.7
A–VO_2 diff (ml/l)	5.8±1.5	5.6±1.1	6.0±1.2	5.4±1.8	5.7±1.5	5.3±1.6
EDVI (ml/m^2)	79±18	72±24	109±55	85±25	117±51	89±27†
ESVI (ml/m^2)	41±13	39±21	54±30	45±22	54±42	50±25
EF	0.48±0.10	0.47±0.14	0.51±0.13	0.49±0.13	0.56±0.15	0.45±0.13†
RgV (ml)	. . .	. . .	53±68	18±22‡	59±45	11±17†
RgV/EDV	. . .	. . .	0.37±0.34	0.19±0.20‡	0.49±0.31	0.12±0.17†
FSV/EDV	. . .	. . .	0.37±0.26	0.43±0.20	0.32±0.21	0.45±0.17*
Mean mitral gradient (mm Hg)	15±7	8±3†	12±5	7±4*	. . .	. . .
Mean orifice area (cm^2)	1.2±0.4	1.8±0.6†	1.8±1.2	1.9±0.5	. . .	. . .

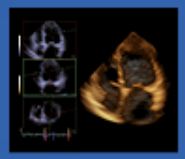
Crawford MH. Circulation 1990;81:1173-1181











EuroValve

Hospital Universitario Ramón y Cajal

SaludMadrid

Comunidad de Madrid

MITRAL VALVE DISEASE

- In mitral stenosis and mitral regurgitation PH has been largely documented (>40% and 20-30% respectively).

- PH is a major risk factor for **poor outcome** after surgery for mitral stenosis or mitral regurgitation.

- Even non-severe PH is associated with significantly worse exercise capacity and higher morbidity and mortality.

- Therefore, the **normalization of PA pressure** is a crucial goal of MVR.

Vincens JJ, et al. Circulation 1995
Salomon et al. Circulation 1977;
Crawford MH et al. , Circulation 1990

PMC for MS and surgery for MR should be considered when systolic PAP>50 mm Hg

MR: rest PAP>50 (IIa) or SPAP≥ 60 mm Hg on exercise (IIb)

MS: PMC when rest SPAP >50 mmHg(IIa)

Guidelines on the management of valvular heart disease. ESC 2012

Return to normal or near normal levels of systolic PAP is expected in most patients.

Parameter	Mitral valve replacement		Mitral valve repair		
	Bioprosthetic	Mechanical	Physiological	Functional	Stenosis
No. of patients	33	20	43	78	5
Preop. RVSP (mmHg)⁺	56 ± 15*	52 ± 12	48 ± 14	49 ± 14	52 ± 16
Postop. RVSP (mmHg)⁺	47 ± 17	42 ± 6	42 ± 12	45 ± 13	45 ± 16
ΔRVSP (mmHg)⁺	-9 ± 24	-10 ± 14	-6 ± 16	-3 ± 15	-7 ± 18
p-value	0.04	0.003	0.01	0.07	0.44
Preop. RVSP ≥40 mmHg	29 (88)†	18 (90)	30 (70)	60 (77)	3 (60)
Postop. RVSP ≥40 mmHg	22 (67)	14 (70)	24 (56)§	51 (65)	3 (60)
Postop. RVSP increased	6 (18)	6 (6)‡	4 (9)	18 (23)	1 (20)
Postop. RVSP decreased / unchanged	27 (82)	20 (100)	39 (91)	60 (77)	4 (80)

Walls et al. J Heart Valve Dis 2008

Persistent pulmonary hypertension **is not uncommon** after mitral valve surgery

advanced mitral valve disease with fixed increased resistance of the pulmonary vasculature

residual postoperative mitral stenosis in the form of mitral prosthesis-patient mismatch

Impact of Valve Prosthesis-Patient Mismatch on Pulmonary Arterial Pressure After Mitral Valve Replacement

Mingzhou Li, MD, PHD, Jean G. Dumesnil, MD, FACC, Patrick Mathieu, MD, Philippe Pibarot, DVM, PHD, FACC

JACC Vol. 45, No. 7, 2005
April 5, 2005:1034–40

- EOA of mitral prosthetic valves are often too small.
- Residual pressure gradients across mitral prosthesis may hinder/delay the regression of LA and pulmonary pressure

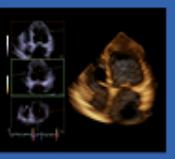


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Table 1. Demographic, Preoperative, and Operative Data

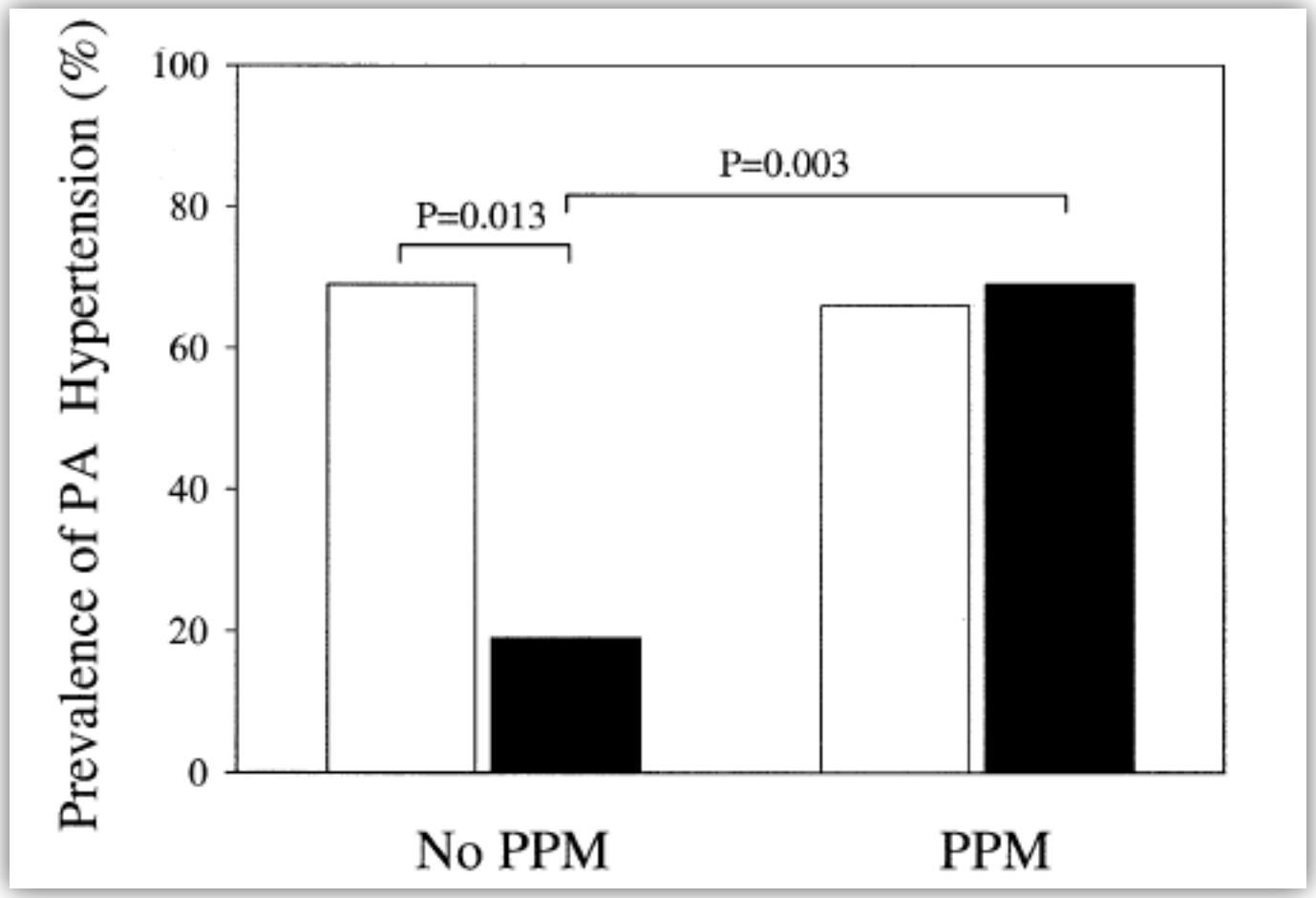
Variables	All Patients (n = 56)	No PPM (n = 16)	PPM (n = 40)	p Value*
Demographic data				
Gender				NS
Female	36 (64%)	10 (63%)	26 (65%)	
Male	20 (36%)	6 (38%)	14 (35%)	
Age (yrs)	65 ± 12	63 ± 14	66 ± 11	NS
Body surface area (m^2)	1.72 ± 0.17	1.64 ± 0.18	1.75 ± 0.16	0.03
Preoperative data				
Predominant valvular dysfunction				NS†
Mitral stenosis	23 (41%)	8 (47%)	15 (36%)	
Mitral regurgitation	24 (43%)	5 (33%)	19 (48%)	
Mixed mitral valve dysfunction	9 (16%)	3 (20%)	6 (15%)	
Coronary artery disease	12 (21%)	2 (13%)	10 (25%)	NS†
Diabetes	4 (7%)	1 (6%)	3 (8%)	NS†
Systemic arterial hypertension	17 (30%)	1 (6%)	16 (40%)	0.02†
Pulmonary arterial hypertension	32/48 (67%)	11/16 (69%)	21/32 (66%)	NS
Operative data				
Type of prosthesis				NS†
Mechanical prosthesis	47 (84%)	14 (88%)	33 (83%)	
Bioprosthesis	9 (16%)	2 (13%)	7 (18%)	
Prosthesis size (mm)			*	0.001†
25	7 (13%)	2 (13%)	5 (13%)	
27	22 (39%)	1 (6%)	21 (53%)	
29	15 (27%)	7 (44%)	8 (20%)	
31	10 (18%)	5 (31%)	5 (13%)	
33	2 (4%)	1 (6%)	1 (2%)	
Total chordal preservation	5 (9%)	2 (13%)	3 (8%)	NS
Posterior chordal preservation	18 (32%)	3 (19%)	13 (33%)	NS
Left atrial appendage obliteration	13 (23%)	4 (25%)	9 (23%)	NS†
Maze procedure	5 (9%)	2 (13%)	3 (8%)	NS†
Coronary artery bypass graft	11 (20%)	1 (6%)	10 (24%)	NS†

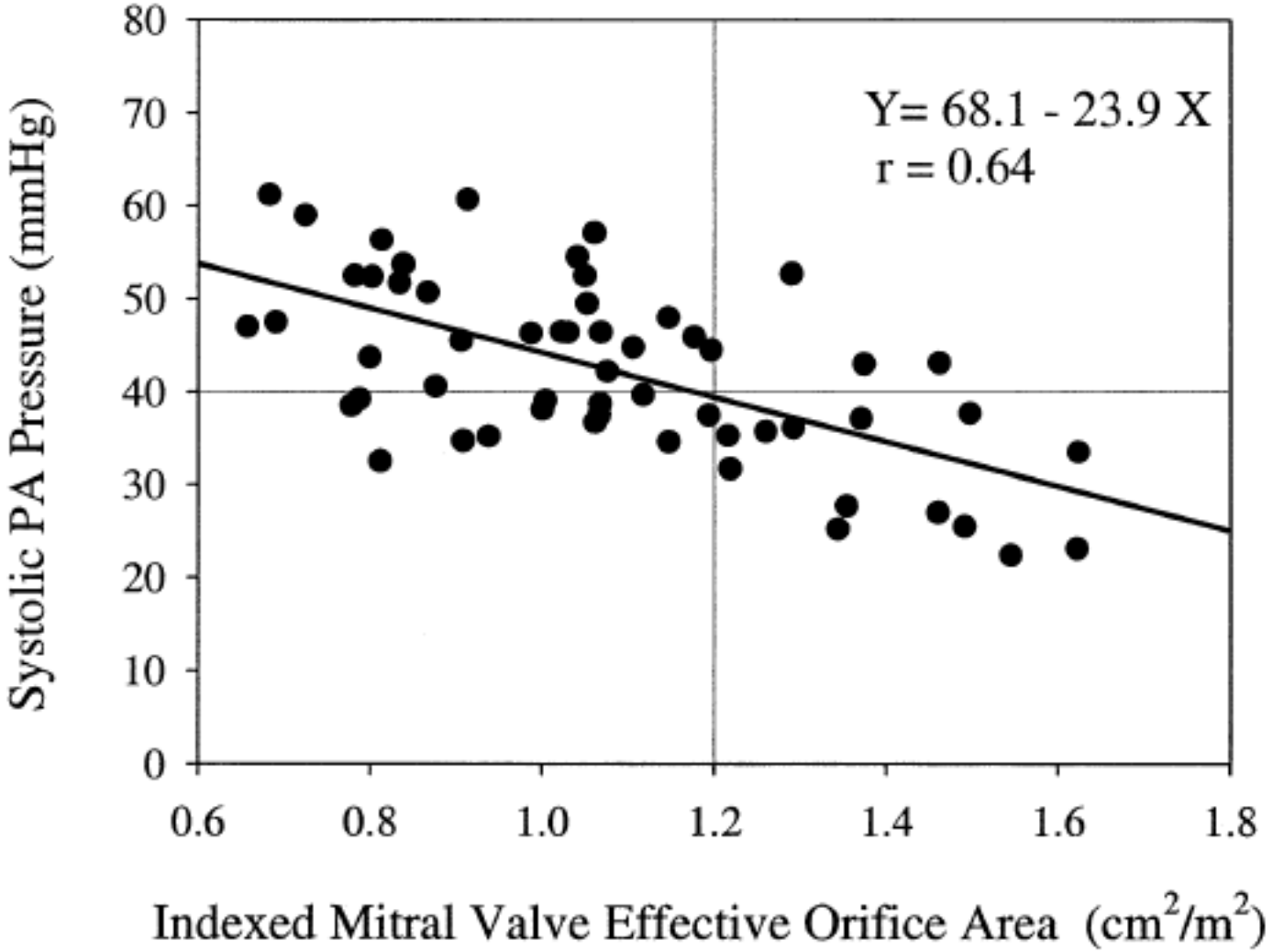
PPM:
EOA ≤ 1.2 cm^2/m^2

Small prosthesis (< 27 mm) in 52% of patients

Table 2. Postoperative Doppler Echocardiographic Data

Variables	All Patients (n = 56)	No PPM (n = 16)	PPM (n = 40)	p Value
Atrial fibrillation	22 (39%)	7 (44%)	15 (38%)	NS
End-diastolic LV diameter (mm)	49 ± 7	50 ± 7	49 ± 7	NS
End-systolic LV diameter (mm)	34 ± 9	34 ± 9	33 ± 8	NS
End-diastolic interventricular septal thickness (mm)	10 ± 2	10 ± 1	10 ± 2	NS
End-diastolic LV posterior wall thickness (mm)	10 ± 2	10 ± 3	11 ± 2	NS
End-systolic LA diameter (mm)	51 ± 11	52 ± 14	50 ± 10	NS
Mitral valve EOA (cm^2)	1.8 ± 0.4	2.3 ± 0.3	1.7 ± 0.3	<0.001
Indexed mitral valve EOA (cm^2/m^2)	1.1 ± 0.3	1.4 ± 0.1	1.0 ± 0.2	<0.001
Peak transmitral gradient (mm Hg)	11 ± 4	8 ± 2	12 ± 4	<0.001
Mean transmitral gradient (mm Hg)	4 ± 2	3 ± 1	4 ± 2	0.001
~~Net atrioventricular compliance (ml/mm Hg)~~	~~4.1 ± 1.7~~	~~5.3 ± 1.6~~	~~3.6 ± 1.6~~	~~0.001~~
Systolic PA pressure (mm Hg)	42 ± 10	34 ± 8	46 ± 8	<0.001
PA hypertension (systolic PA pressure >40 mm Hg)	30 (54%)	3 (19%)	27 (68%)	0.001†


Prevalence of PA Hypertension (%)
100
80
60
40
20
0
P=0.013
P=0.003
No PPM
PPM


Y= 68.1 - 23.9 X
r = 0.64
Systolic PA Pressure (mmHg)
80
70
60
50
40
30
20
10
0
0.6
0.8
1.0
1.2
1.4
1.6
1.8
Indexed Mitral Valve Effective Orifice Area (cm²/m²)

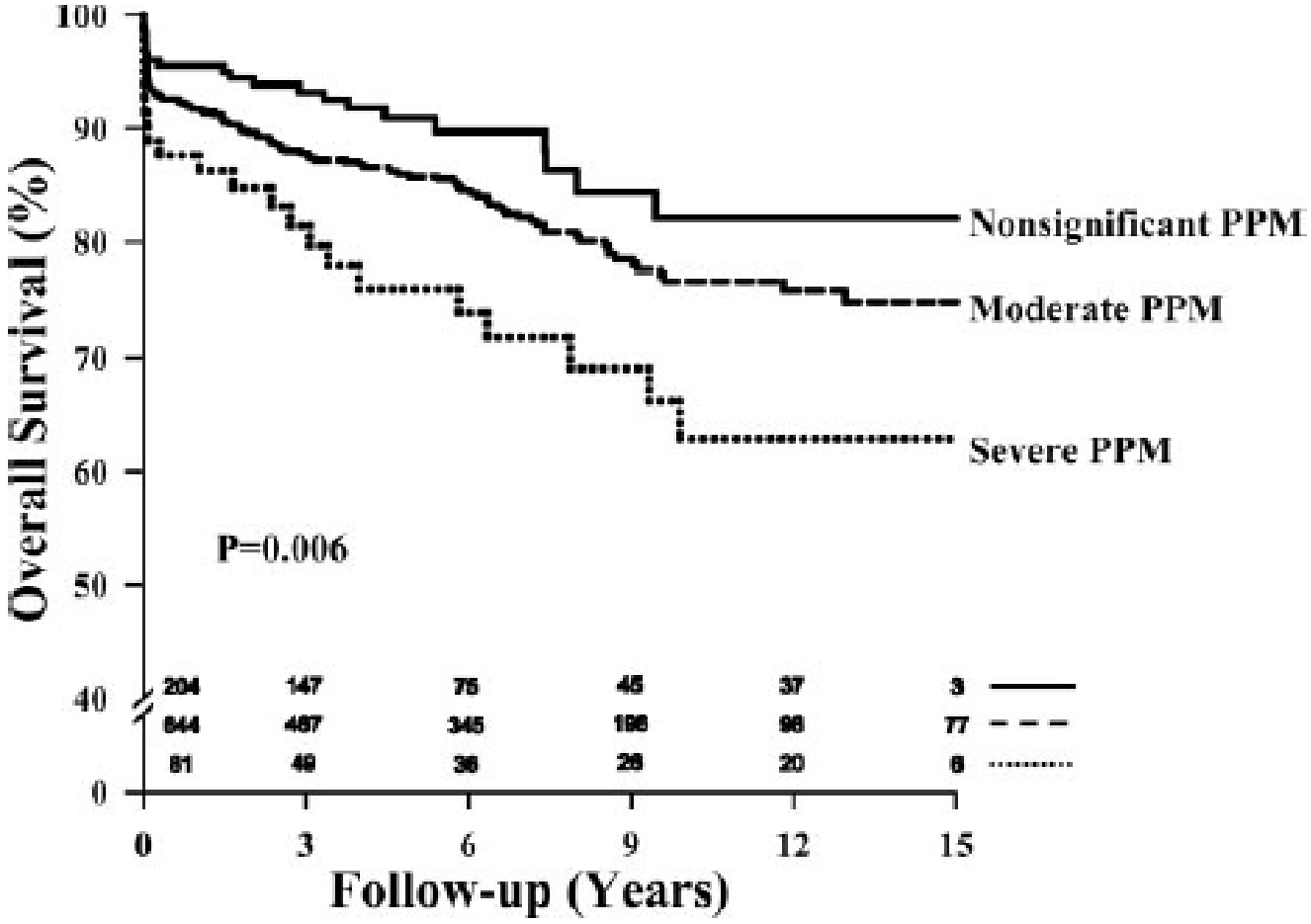
Impact of Prosthesis-Patient Mismatch on Survival After Mitral Valve Replacement

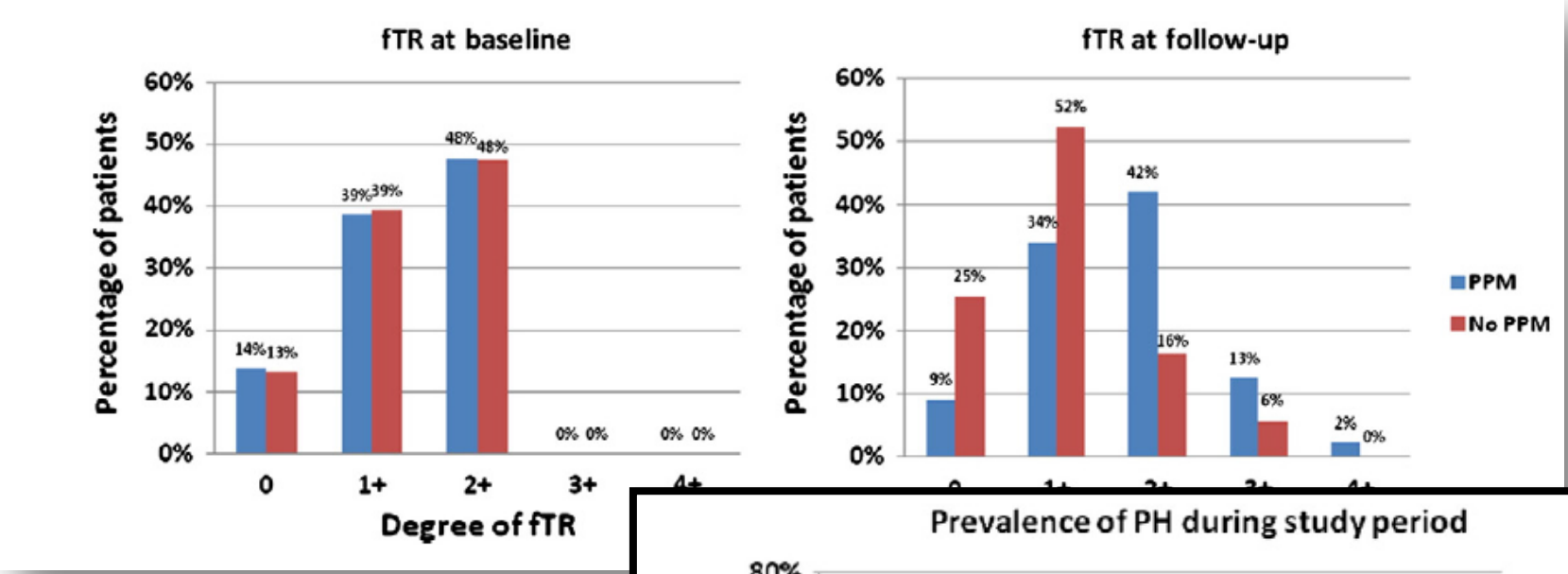
Julien Magne, MSc; Patrick Mathieu, MD, FRCPC; Jean G. Dumesnil, MD, FRCPC; David Tanné, Eng; François Dagenais, MD, FRCPC; Daniel Doyle, MD, FRCPC; Philippe Pibarot, DVM, PhD

Circulation. 2007;115:1417-1425

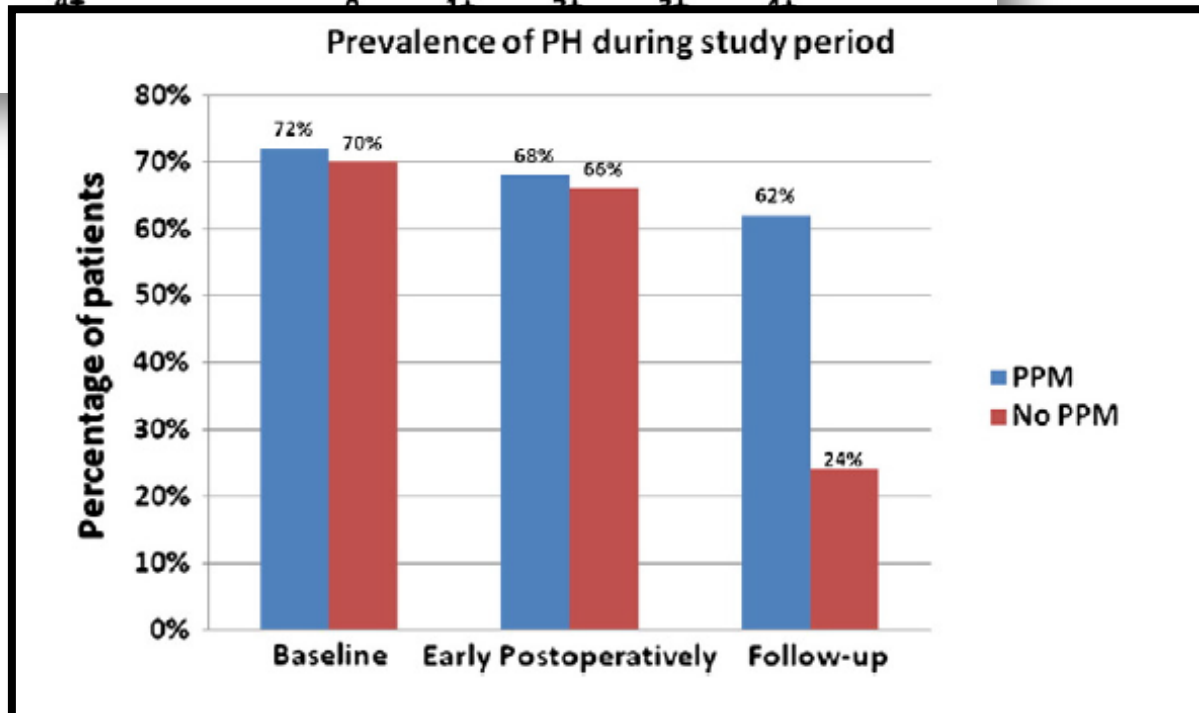
- The impact of PPM on mortality in patients undergoing mitral valve replacement.
- 929 consecutive patients.
- The mean follow-up was 6.3 ± 4.5 years
- PPM moderate > 0.9 and ≤1.2 cm^2 /m^2

  PPM severe ≤ 0.9 cm2 /m2


Overall Survival (%)
100
90
80
70
60
50
40
0
Nonsignificant PPM
Moderate PPM
Severe PPM
P=0.006
204 147 75 45 37 3
844 487 345 186 98 77
81 49 38 28 20 6
0 3 6 9 12 15
Follow-up (Years)



- 210 patients undergoing isolated MVR
- follow-up: median 27 months



Angeloni E. International Journal of Cardiology 2013

OUR EXPERIENCE

300 patients

9 died periperatively

135: referred from other centers (lack of follow-up)

35: insufficient follow-up

10: lost

111 patients included

19,1 ± 10,4 months

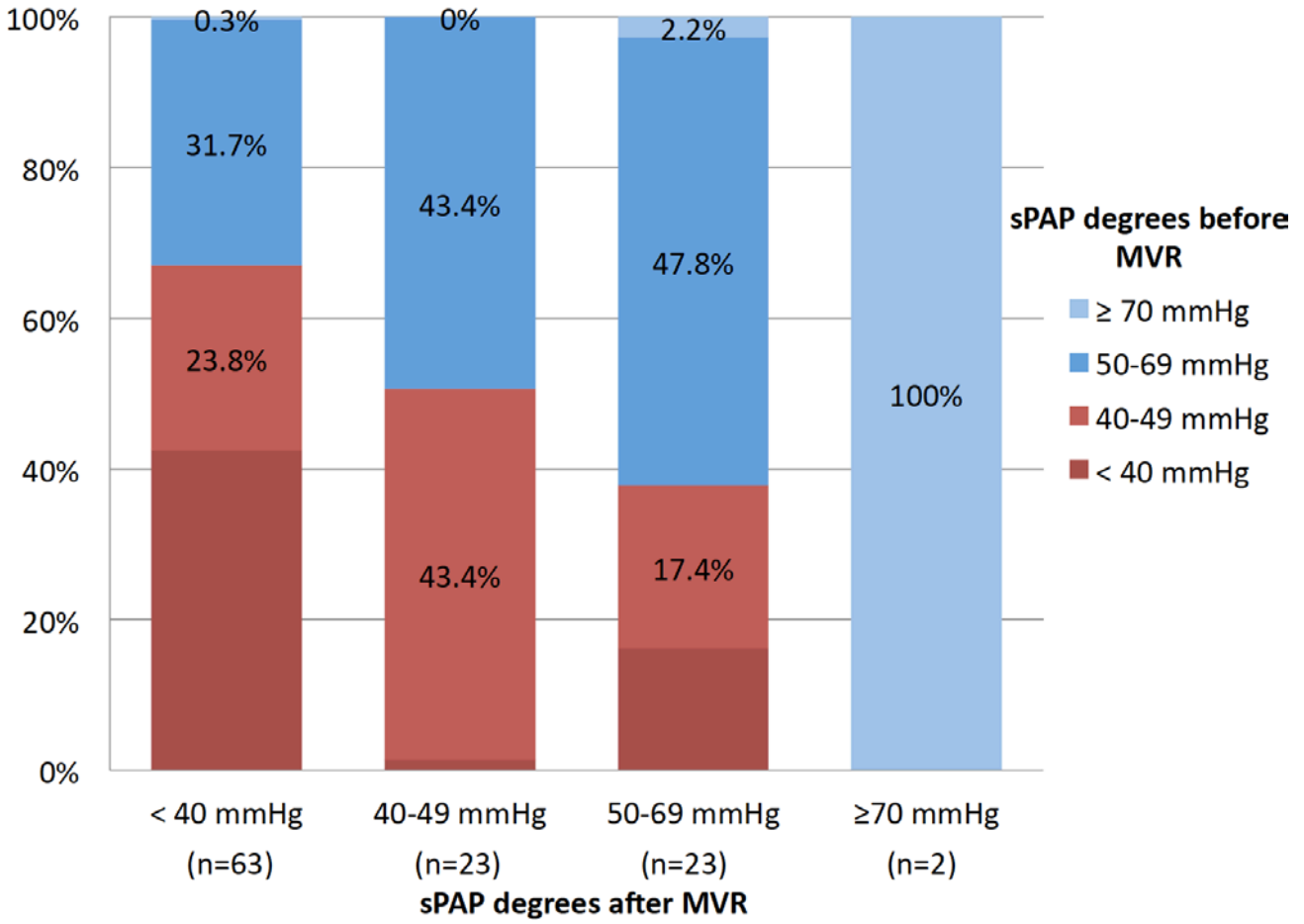
Briongos Figuero S, ESC 2014

	Total population (n=111)	No preoperative PH (n=32)	Preoperative PH (n=79)	p value
Age (years) (SD)	69.7 (8.6)	67.8 (10.3)	69.2 (9.0)	0.444
Predominant mitral dysfunction				
• Regurgitation			40 (36%)	
• Stenosis			44 (39.6%)	
• Mixed dysfunction			27 (24.3%)	
TR severity				
• ≤2			73 (65.8%)	
• ≥3			38 (34.2%)	
AF			78.9%	
Average LVEF (%)(SD)	64.6 (9.9)	65.0 (11.0)	64.5 (9.4)	0.831
Mean sPAP (mmHg) (SD)			52.6 (13.9)	
Degrees of sPAP, n (%)				
• < 40 mmHg			32 (28.8%)	
• 40-50 mmHg			29 (26.2%)	
• 51-69 mmHg			41 (36.9%)	
• ≥ 70 mmHg			9 (8.1%)	
Prosthesis size, n (%)				
• 23			2 (1.8%)	
• 25			58 (53.2%)	
• 27			31 (28.4%)	
• 29			15 (13.5%)	
• 31			3 (2.7%)	

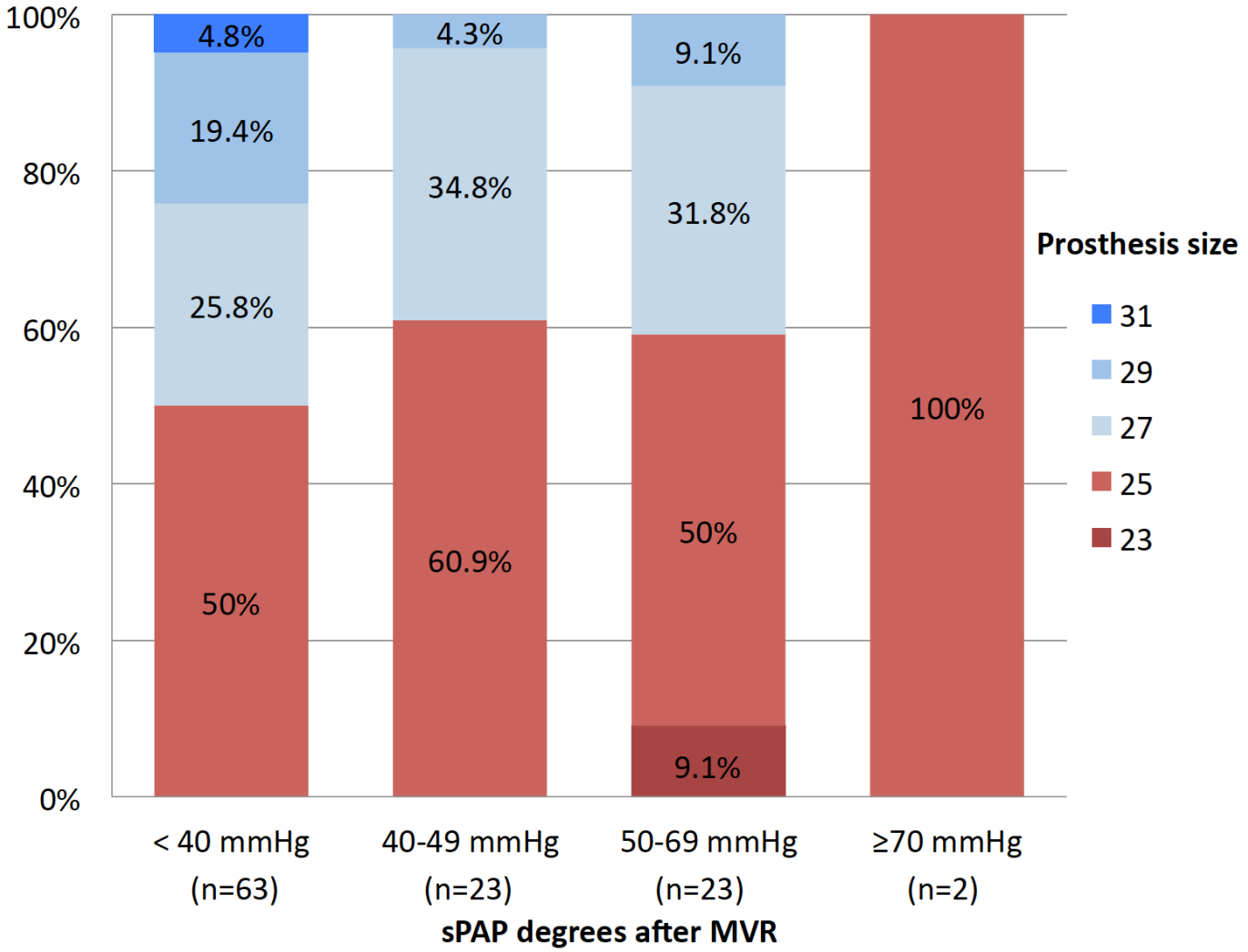
45%

Change in sPAP after Surgery

The proportion of patients with PH was reduced from 71.2% to 43.2% (n=48) after MVR



	No Persistent-PH (n=63)	Persistent-PH (n=48)	p value
Prosthesis size, n (%) • 23 • 25 • 27 • 29 • 31	 0 (0%) 31 (53.4%) 16 (51.6%) 12 (80%) 3 (100%)	 2 (100%) 27 (46.6%) 15 (48.4%) 3 (20%) 0 (0%)	0.027



Clinical implications I

1. Persistent PH is frequent after MVR and strongly associated with the presence of **valve PPM.**

Avoid PPM by using a prospective strategy at the time of operation.

- *MV reparation*
- *in MVR use the largest EOA*
- *concomitant tricuspid valve annuloplasty in patients with pre-existing functional TR in whom PPM is anticipated*

Clinical implications II

2. Persistent PH after MVR is associated with the **degree of PH before surgery.**

- *More severe and chronic left heart disease.*

- *In the absence of a class I indication, it is not clear the optimal time for surgery.*
  This may lead clinicians to overlook the prognostic value of PH or TR, postponing an earlier timing for surgery.

Restrictive Annuloplasty for Ischemic Mitral Regurgitation May Induce Functional Mitral Stenosis

Julien Magne, MSc, Mario Sénéchal, MD, FRCPC, Patrick Mathieu, MD, FRCPC,
Jean G. Du
Philippe Pi

diol 2008

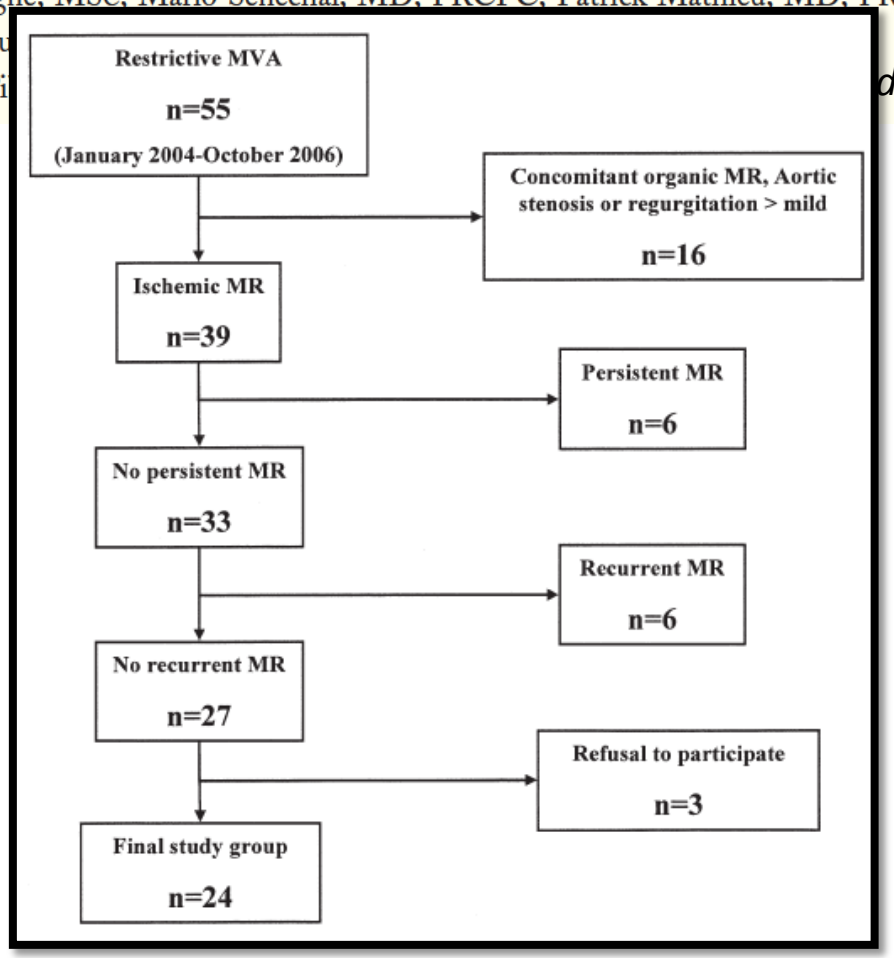
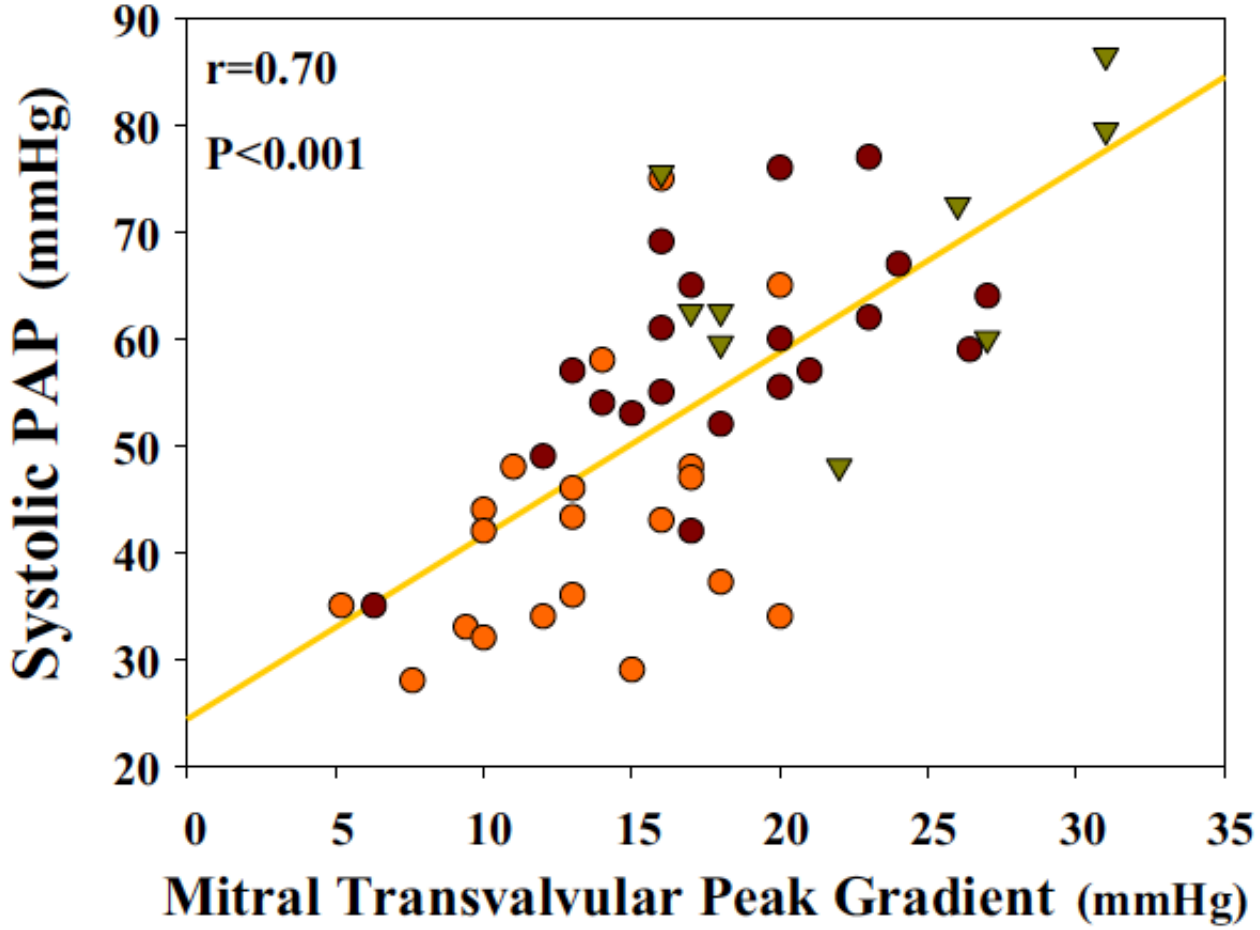
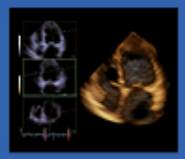


Table 2 Comparison of Resting and DSE Among the Control Group (n = 20) and the MVA Group (n = 24)

Variables	Control Group (n = 20)		MVA Group (n = 24)	
	Rest	DSE	Rest	DSE
LV geometry				
LVED diameter, mm	46 ± 7	39 ± 6*	55 ± 6†	50 ± 9*†
LVES diameter, mm	28 ± 9	27 ± 8	42 ± 9†	39 ± 12†
LVED indexed diameter, mm/m^2	27 ± 4	21 ± 7*	30 ± 5	29 ± 7*
LVES indexed diameter, mm/m^2	18 ± 5	12 ± 8	24 ± 6	22 ± 7
LV function				
LV ejection fraction, %	45 ± 11	55 ± 13*	43 ± 11	56 ± 13*
Net atrioventricular compliance, ml/mm Hg	9.2 ± 6	6.2 ± 4	3.3 ± 1.2†	3.2 ± 1.2
LV stroke volume, ml/beat	58 ± 13	67 ± 24*	67 ± 14†	80 ± 18*†
Heart rate, beats/min	76 ± 19	123 ± 15*	66 ± 11†	99 ± 20*†
Cardiac output, l/min	4.3 ± 1.3	8.3 ± 3.3*	4.6 ± 1.2	7.8 ± 1.6*
Diastolic filling time, ms	370 ± 170	204 ± 73*	476 ± 143†	368 ± 128*†
Mitral valve hemodynamics				
Effective orifice area, cm^2	2.9 ± 1.1	4.2 ± 1.6*	1.5 ± 0.3†	1.8 ± 0.3*†
Indexed effective orifice area, cm^2/m^2	1.7 ± 0.5	2.4 ± 1*	0.8 ± 0.2†	1.0 ± 0.2*†
Mitral peak gradient, mm Hg	4 ± 1	6 ± 3*	13 ± 4†	19 ± 6*†
Mitral mean gradient, mm Hg	2 ± 1	3 ± 1*	6 ± 2†	8 ± 3*†
MR jet vena contracta width, mm‡	0.1 ± 0.1	0 ± 0†	0.8 ± 0.9	0.6 ± 0.9†
Systolic pulmonary arterial pressure, mm Hg	27 ± 8	38 ± 11*	42 ± 13†	58 ± 12*†


r=0.70
P<0.001
Systolic PAP (mmHg)
90
80
70
60
50
40
30
20
0
5
10
15
20
25
30
35
Mitral Transvalvular Peak Gradient (mmHg)



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Kainuma S. Circulation 2011

Table 2. Postoperative Echocardiographic Measurements

Variables	All Cases (n=108)	Physio 24 mm (n=66)	Physio 26 mm (n=42)	*P* Value*
Geometric orifice area, cm^2		2.74	3.25	
Indexed GOA, cm^2/m^2	1.80±0.22	1.72±0.20	1.93±0.19	<0.001
Mitral mean gradient, mm Hg	2.9±1.1	3.1±1.1	2.6±1.1	0.01
<5 mm Hg	98 (91%)	58 (88%)	40 (95%)	NS
≥5 mm Hg	10 (9%)	8 (12%)	2 (5%)	
Mitral valve EOA, cm^2	2.4±0.4	2.3±0.4	2.6±0.3	<0.001
≥1.5 cm^2	108 (100%)	66 (100%)	42 (100%)	NS
<1.5 cm^2	0 (0%)	0 (0%)	0 (0%)	
Indexed EOA, cm^2/m^2	1.51±0.32	1.48±0.34	1.54±0.27	NS
>1.2 cm^2/m^2	85 (79%)	48 (73%)	37 (88%)	NS
>0.9 to 1.2 cm^2/m^2	21 (19%)	17 (26%)	4 (10%)	
≤0.9 cm^2/m^2	2 (2%)	1 (1%)	1 (2%)	
<40 mm Hg	82 (76%)	51 (77%)	31 (74%)	
Systolic PAP, mm Hg	32±8	31±9‡	32±6‡	NS
Not determined†	9 (8%)	5 (8%)	4 (10%)	NS
<40 mm Hg	82 (76%)	51 (77%)	31 (74%)	
40–60 mm Hg	17 (16%)	10 (15%)	7 (17%)	
>60 mm Hg	0 (0%)	0 (0%)	0 (0%)	
Residual mitral regurgitation, 0/1+/2+/3+/4+	66/34/8/0/0	40/22/4/0/0	26/12/4/0/0	NS
Residual tricuspid regurgitation, 0/1+/2+/3+/4+	9/86/13/0/0	5/56/5/0/0	4/30/8/0/0	NS

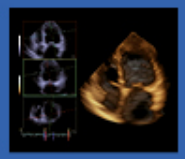

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Table 4. Preoperative and Postoperative Hemodynamic Measurements

	Physio No. 24 (n=32)		Physio No. 26 (n=26)				
Variables	Preop	Postop	Preop	Postop	Group	Time	Group-Time
LV end-diastolic volume index, mL/m^2	135±35	109±35	150±47	126±49	NS	<0.001	NS
LV end-systolic volume index, mL/m^2	101±30	78±33	113±44	90±48	NS	<0.001	NS
LV ejection fraction, %	26±7	30±12	26±8	31±12	NS	0.002	NS
LV systolic pressure, mm Hg	115±21	121±14	123±21	124±24	NS	NS	NS
LVEDP, mm Hg	17±6	9±3	17±7	11±3	NS	<0.001	NS
PCWP, mm Hg	21±6	13±3	21±8	13±3	NS	<0.001	NS
Mitral gradient (=mean PCWP−LVEDP), mm Hg		3.3±1.4		2.6±1.0*			
Systolic PAP, mm Hg	46±13	34±9	46±16	34±9	NS	<0.001	NS
<40 mm Hg	10 (31%)	24 (75%)	11 (42%)	19 (73%)			
40–60 mm Hg	19 (60%)	8 (25%)	10 (38%)	7 (27%)			
>60 mm Hg	3 (9%)	0 (0%)	5 (19%)	0 (0%)			
Mean PAP, mm Hg	32±7	21±6	33±9	22±6	NS	<0.001	NS
Right atrial pressure, mm Hg	8±4	8±3	7±4	8±2	NS	NS	NS
Heart rate, beats/min	78±11	79±13	76±15	81±10	NS	NS	NS
Cardiac index, L/min/m^2	2.7±0.7	2.9±0.7	2.3±0.6	2.8±0.6	NS	<0.001	0.02
Stroke volume index, mL/m^2	36±11	38±10	31±9	35±5	NS	0.02	NS
PVR, dyne · s · cm^{-5}	235±73	150±75	250±71	156±67	NS	<0.001	NS
SVR, dyne · s · cm^{-5}	1470±460	1370±440	1620±400	1220±250	NS	<0.001	0.02

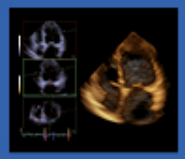
Table 5. Determinants of Postoperative Catheter-Measured Systolic PAP 1 Month After RMA

	Univariate		Multivariate	
Variables	ρ	*P* Value	SPRC	*P* Value
Preop echocardiographic parameters (n=108)				
LVEDD, mm		NS		
LVESD, mm		NS		
LV ejection fraction, %		NS		
LA dimension, mm	0.35	0.007	0.23	0.009
RVEDD, mm		NS		
Systolic PAP, mm Hg	0.54	<0.001		
Preop volume and function parameters (n=97)				
LVEDVI, mL/m^2		NS		
LVESVI, mL/m^2		NS		
LV ejection fraction, %		NS		
Preop hemodynamic parameters (n=75)				
LVSP, mm Hg		NS		
LVEDP, mm Hg	0.26	0.08		
PCWP, mm Hg	0.28	0.06		
Systolic PAP, mm Hg	0.33	0.02		
Postop hemodynamic parameters (n=58)				
LVSP, mm Hg		NS		
LVEDP, mm Hg	0.56	<0.001	0.51	<0.001
PCWP, mm Hg†	0.70	<0.001		
Mitral gradient (mean PCWP−LVEDP), mm Hg	0.44	<0.001		

(*Continued*)

Postop hemodynamic parameters (n=58)
LVSP, mm Hg NS
LVEDP, mm Hg 0.56 <0.001 0.51 <0.001
PCWP, mm Hg† 0.70 <0.001
Mitral gradient (mean PCWP−LVEDP), mm Hg 0.44 <0.001

There was no difference in freedom from adverse cardiac events between patients with an indexed EOA of >1.2 cm^2/m^2 versus ≤1.2 cm^2/m^2



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AORTIC VALVE DISEASE

PH in aortic stenosis

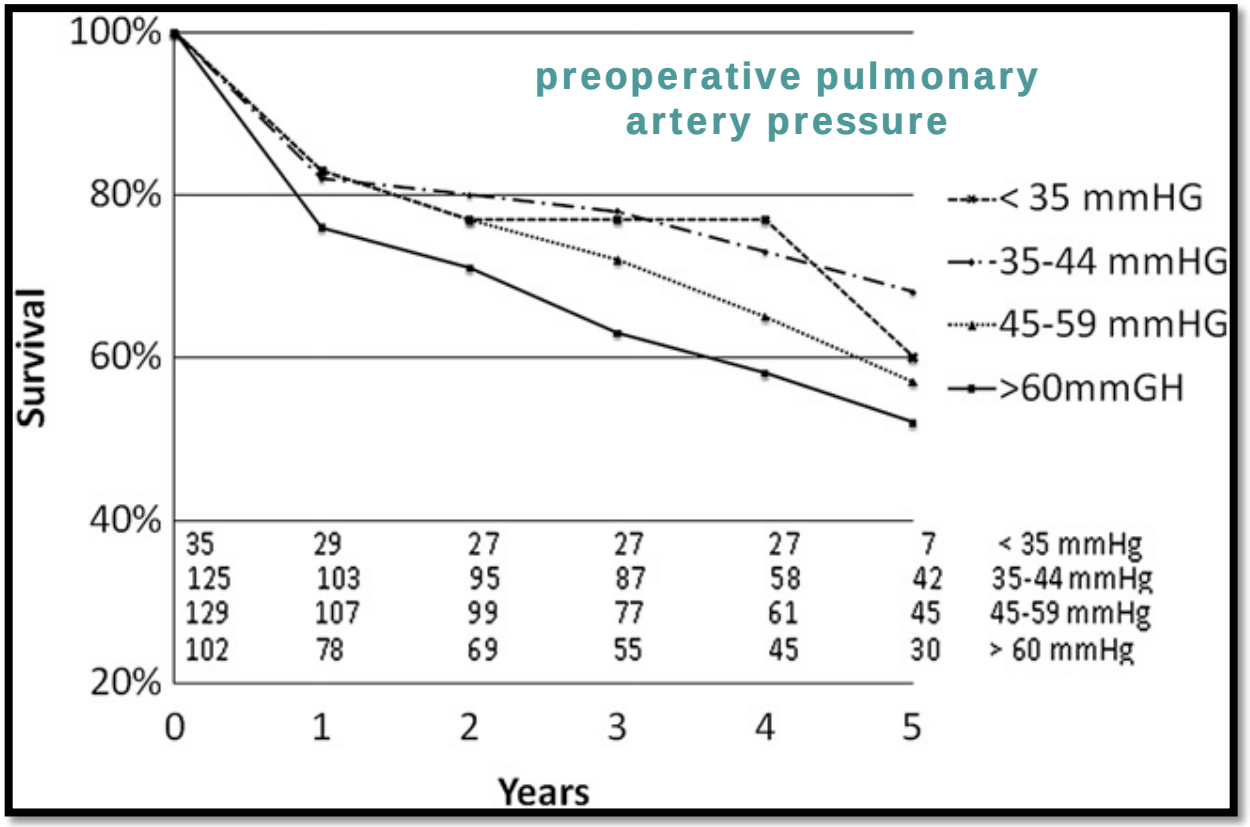
LV diastolic dysfunction, with passive transmission of increased LV end-diastolic and left atrial pressures to the pulmonary arteries

Degree of mitral regurgitation

AORTIC STENOSIS

1080 patients undergoing AVR. Follow-up was 4.0 ±3.4 years

- 574 (53%) with normal sPAP.
- 506 (47%) with PH (sPAP > 35 mm Hg).

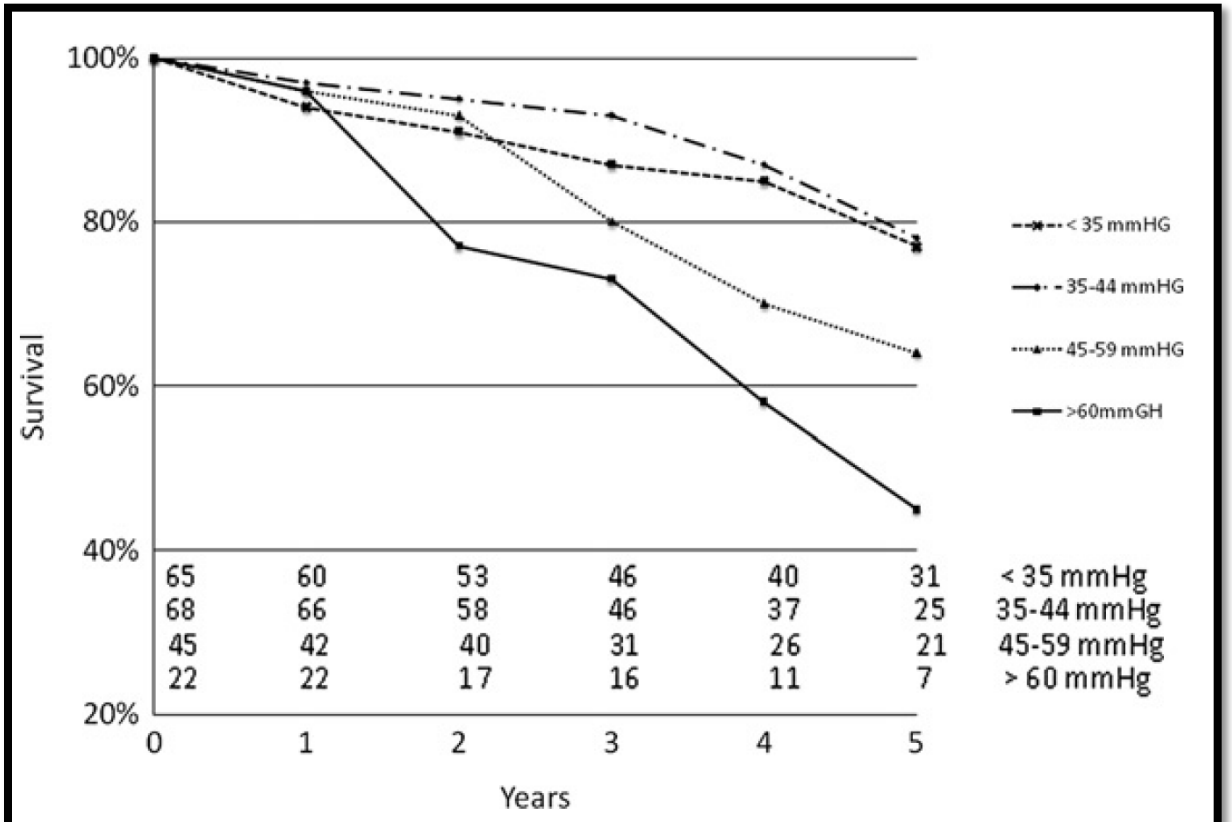


Melby SJ, et al. J Thorac Cardiovasc Surg 2011.

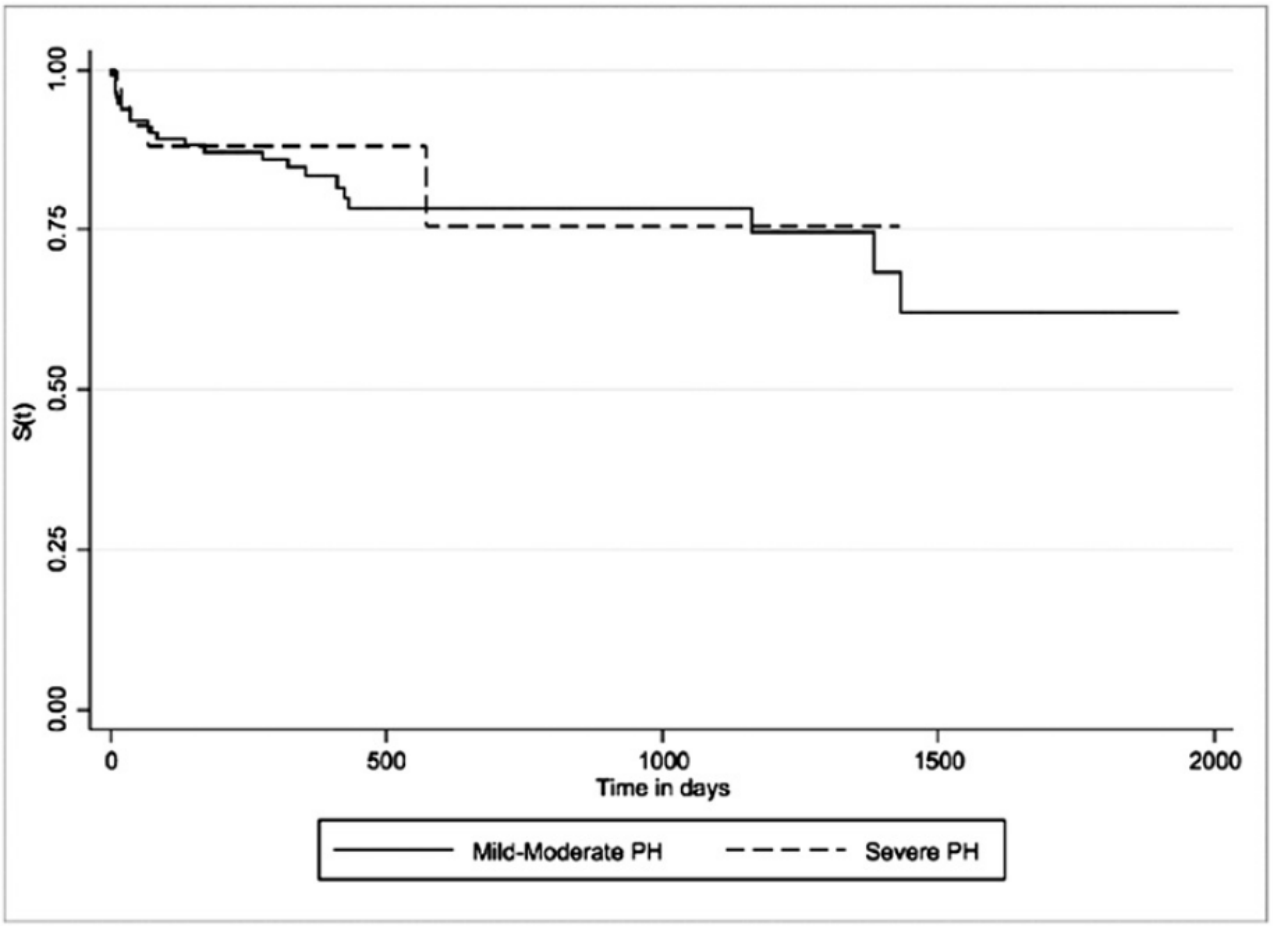
TABLE 3. Change in systolic pulmonary artery pressure after aortic valve replacement in patients with mild, moderate, and severe pulmonary hypertension

Group	Mean preop sPAP	Mean postop sPAP	*P* value
35–44 mm Hg (n = 61)	39 ± 3	37 ± 11	.218
45–59 mm Hg (n = 58)	51 ± 4	45 ± 16	.014
≥60 mm Hg (n = 46)	69 ± 12	45 ± 14	<.001
Overall group	51 ± 14	42 ± 14	<.001

postoperative pulmonary artery pressure



Melby SJ, et al. J Thorac Cardiovasc Surg 2011.



Cam et al. J Thorac Cardiovasc Surg 2011

- 81 patients with **severe AS and severe PH** (35 patients underwent AVR). Follow up 347 ±347 days
- 236 patients with **severe AS and mild-moderate PH** (114 underwent AVR). Follow up 548 ±530 days

TABLE 4. Comparison of preoperative and postoperative hemodynamic changes in patients with aortic valve replacement

Characteristic	Preoperative	Postoperative	*P* value	Net change
Systolic PAP (mm Hg)				
Mild-to-moderate PH	36.4 (9.4)	34.1 (10.3)	.008	–2.7 (10.2)
Severe PH	70.5 (14.6)	47.9 (12.0)	<.001	–22.5 (14.4)
P value	<.001	<.001		
Diastolic PAP (mm Hg)				
Mild-to-moderate PH	15.6 (5.5)	15.6 (4.9)	.9	–0.01 (6.5)
Severe PH	31.5 (7.1)	19.7 (5.4)	<.001	–11.8 (7.6)
P value	<.001	<.001		
Mean PAP (mm Hg)				
Mild-to-moderate PH	22.5 (6.6)	21.7 (6.1)	.1	–0.9 (7.0)
Severe PH	45.3 (8.3)	29.0 (6.8)	<.001	–16.2 (9.0)
P value	<.001	<.001		

*High preoperative **PCWP** was a significant preoperative predictor of reduction of mean PAP*

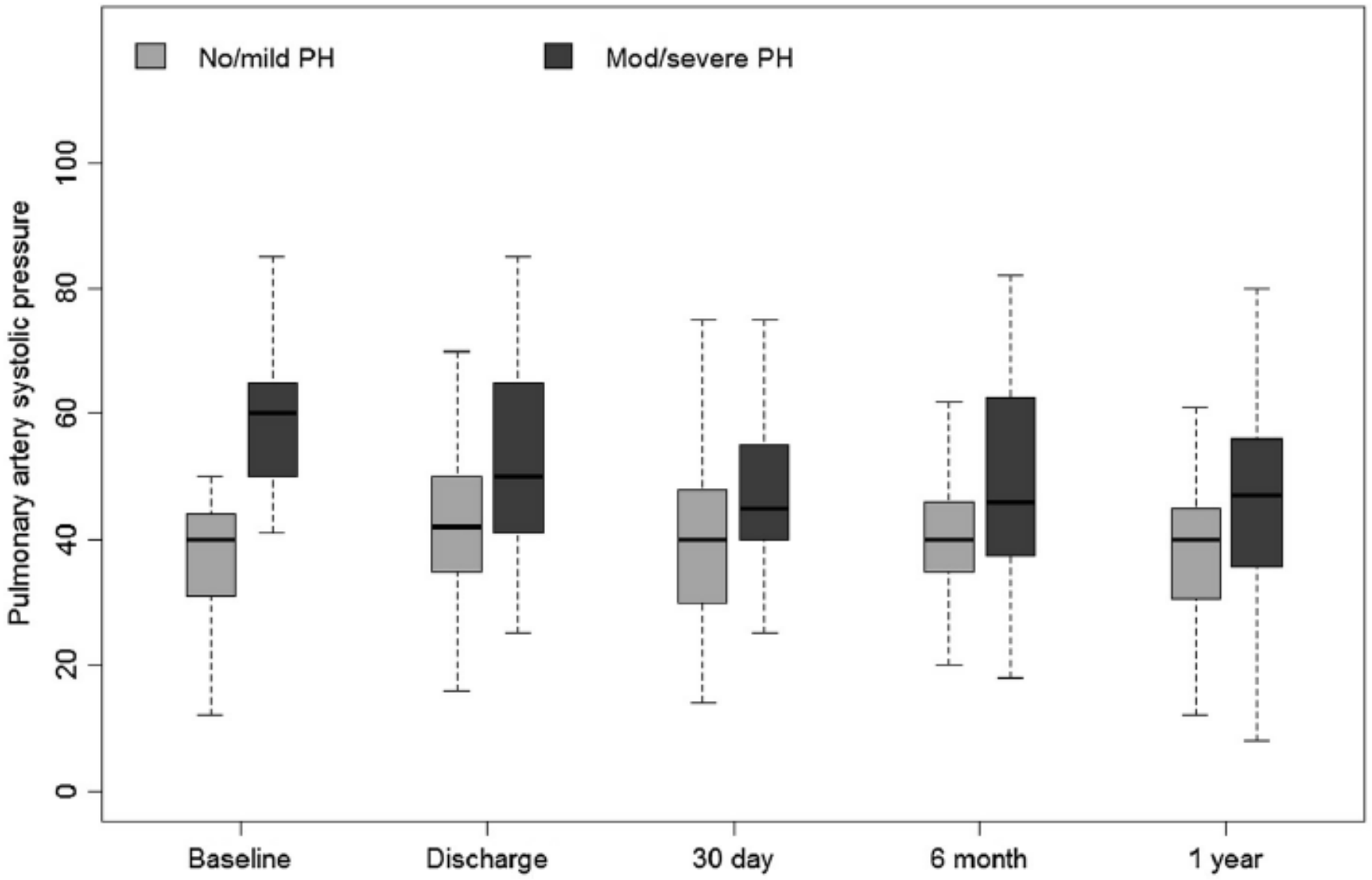
TABLE 5. Mean pulmonary artery pressure changes postoperatively compared with baseline preoperative pulmonary artery pressures stratified by mortality at the end of follow-up

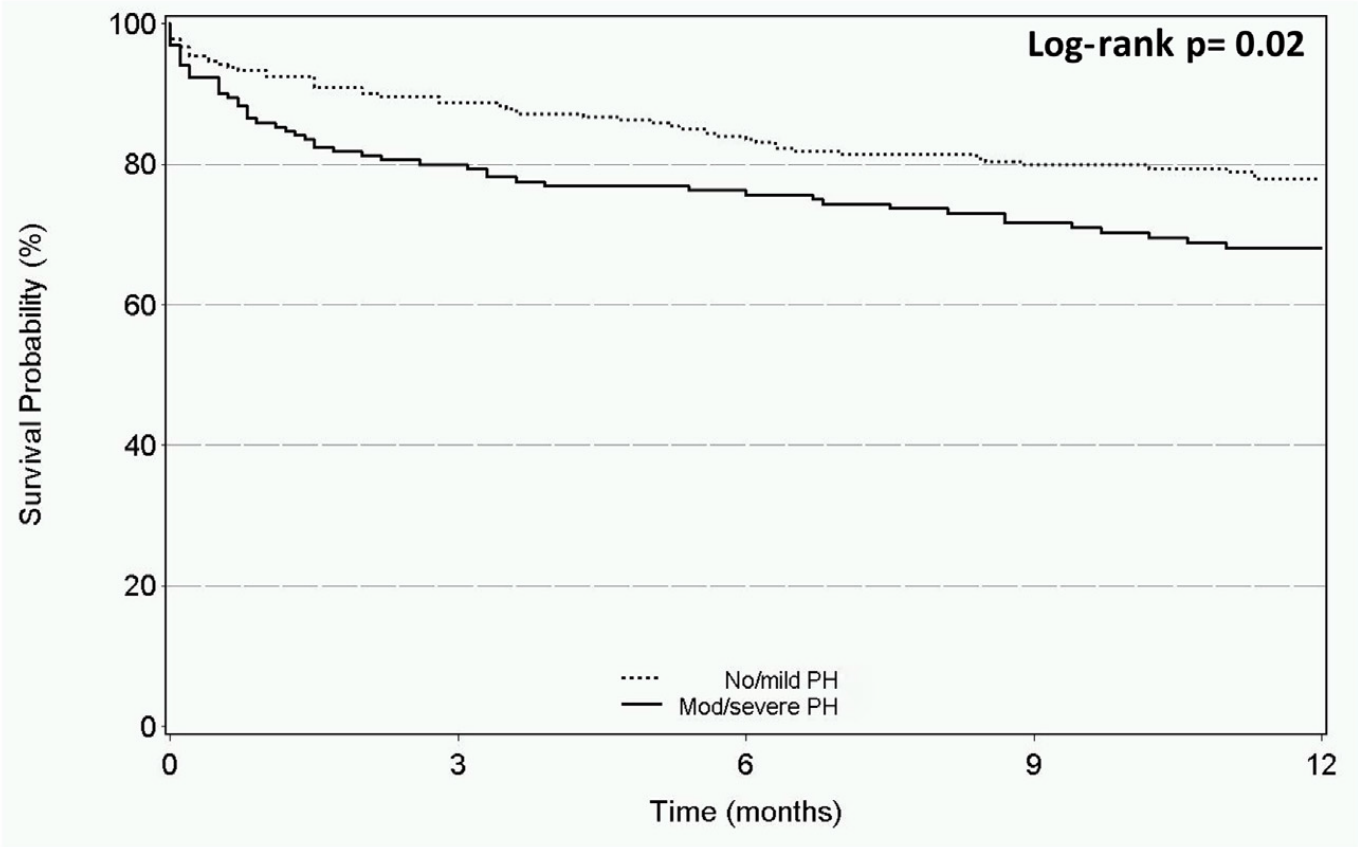
Characteristic	Dead (n = 28)		Survivors (n = 121)	
Mild-to-moderate PH	Preoperative mean PAP	23.6 (6.3)	Preoperative mean PAP	22.5 (6.8)
	Postoperative mean PAP	24.6 (7.2)	Postoperative mean PAP	20.9 (5.5)
	Net change:	1.0 (7.7)	Net change	–1.5 (6.7)
	P value	.5	*P* value	.04
Severe PH	Preoperative mean PAP	51.2 (15.5)	Preoperative mean PAP	44.3 (6.4)
	Postoperative mean PAP	36.1 (8.7)	Postoperative mean PAP	27.9 (5.8)
	Net change	–15.1 (36.3)	Net change	–16.4 (7.4)
	P value	0.1	*P* value	<.001

Prevalence and Impact of Pulmonary Hypertension

Am J Cardiol 2015, ahead of print

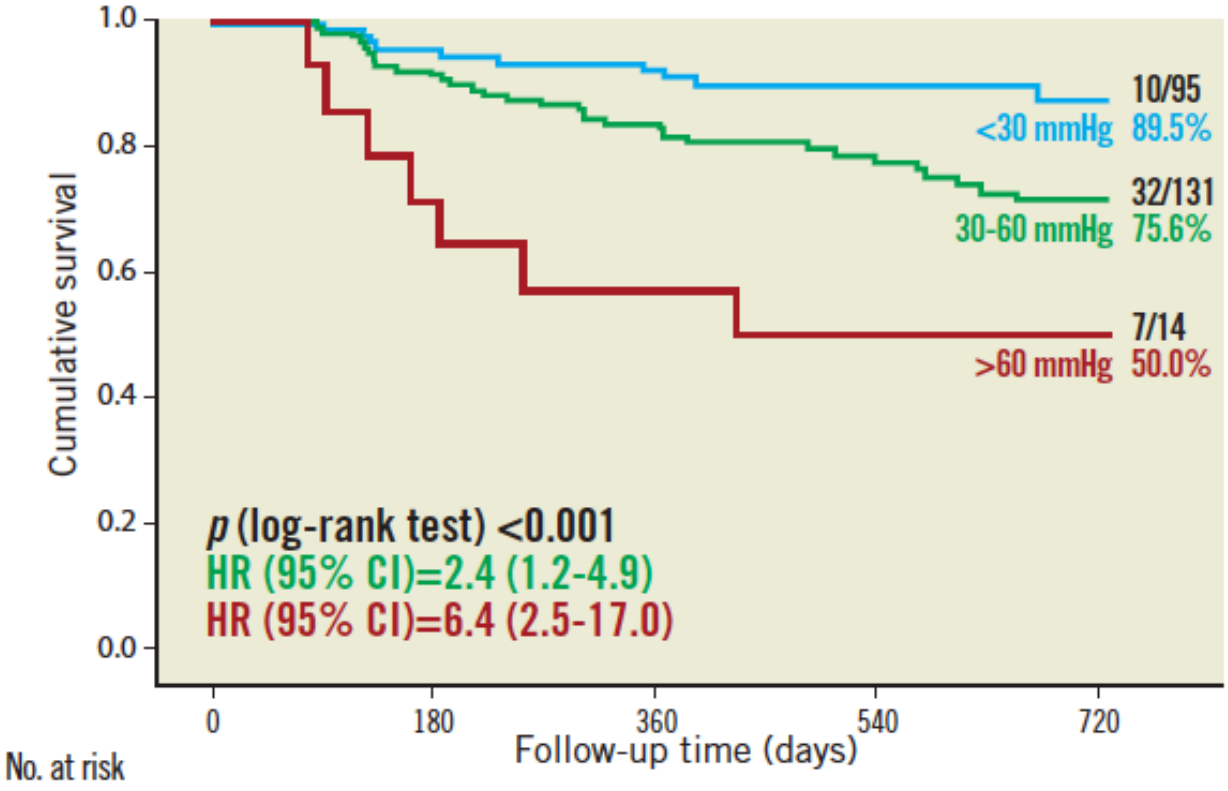
Variable	Pulmonary hypertension		p Value
	No/mild (n=172)	Moderate /severe (n=243)	
Echocardiogrpahy			
Left ventricular ejection fraction (%±SD)	53±17	53±14	0.9
Left ventricular ejection fraction <30%	38 (16%)	21 (12%)	0.3
Aortic valve area (cm^2±SD)	0.65±0.1	0.65±0.1	0.5
Mean gradient (mmHg±SD)	48±13	48±13	0.9
Peak velocity	4.4±0.6	4.4±0.6	0.7
Septal thickness (cm±SD)	1.3±0.2	1.3±0.2	0.6
Posterior wall thickness (cm±SD)	1.2±0.2	1.2±0.2	0.5
Left ventricular end systolic diameter (cm±SD)	3.1±0.9	3.2±0.9	0.2
Moderate or severe mitral regurgitation	19 (8.6%)	29 (18.4%)	
Moderate or severe tricuspid regurgitation	13 (5.9%)	38 (23%)	
Moderate or severe RV dysfunction*	21 (19.8%)	29 (35.3%)	
Moderate or severe RV dilatation	6 (2.6%)	12 (7.3%)	
Systolic pulmonary artery pressure (mmHg±SD)	36±9	61±12	<0.001
Right sided heart catheterization†			
Right atrial pressure; mean (mmHg±SD)	8.9±7.9	8.9±5.5	1
Pulmonary artery pressure (mmHg±SD)			<0.01
Systolic	44.9±13	57±16	
Diastolic	18.9±6	22.8±7	
Mean	28±8	34±9	
Pulmonary capillary wedge pressure; mean (mmHg±SD)	19±8	21±8	0.4
Cardiac output (L/min±SD)	4.2±1.2	4.6±1.5	0.3
Cardiac index (L/min/m^2±SD)	2.5±0.7	2.4±0.8	0.9


No/mild PH
Mod/severe PH
Pulmonary artery systolic pressure
0
20
40
60
80
100
Baseline
Discharge
30 day
6 month
1 year



Mod/Severe	243	211	187	169	154
No/Mild	171	132	119	104	94

*Reduction of SPAP **after TAVR** is associated with favourable prognosis*



Sinning JM. EuroIntervention 2014

D. Medvedofsky et al. Journal of Cardiology 2014

AORTIC REGURGITATION

- PH has been studied less in patients with AR
- Severe PH in 16-24% of the patients
- PH related to high LV end-diastolic pressure
- It is largely reversible after surgery
- Preoperative PH influence on outcomes is controversial.

Khandhar S, et al. Ann Thorac Surg 2009;
Naidoo DP, et al. Q J Med 1991
Hirshfeld JW, et al. Circulation 1974

Therapy

- *The optimal treatment of the underlying left heart disease is recommended in patients with PH due to left heart disease.* I, C
- *There is no specific therapy for PH due to left heart disease.*
- *The use of PAH-specific drugs is not recommended until robust data from long-term studies are available.*

ESC guidelines. Eur Heart J. 2009

Conclusions I

- The **systolic PAP may decrease** following AVR, mitral valve replacement, or percutaneous balloon mitral valvuloplasty.
- Following MVR, the presence of **prosthesis-patient mismatch** precluded normalization of systolic PAP and has been associated with a high rate of postoperative PH.
- The **severity of baseline** PH seem to be correlated with the persistence of PH after surgery .

- Baseline and postoperative PH increased long-term mortality.
- **Earlier intervention** should be considered for asymptomatic or minimally symptomatic patients with significant aortic/mitral valve disease and moderate to severe PH-before irreversible changes in the pulmonary circulation can occur.

Thanks for your attention