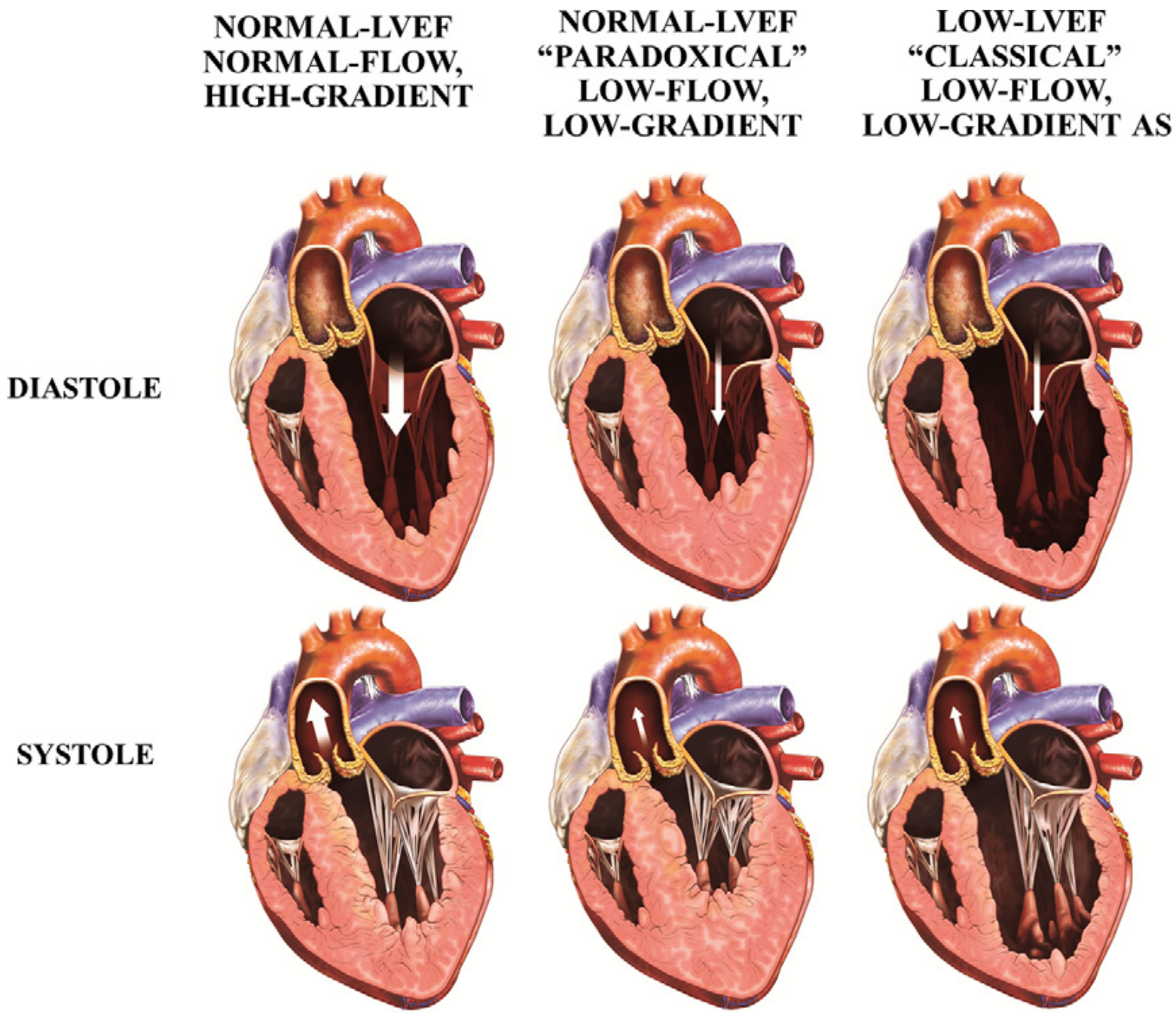
Ospedale "*Sacro Cuore di Gesù*"
Fatebenefratelli Benevento
U.O.C. Cardiologia/UTIC/Emodinamica
Primario: *Prof. Bruno Villari*

Stenosi aortica low-flow low-gradient: MITO

Quirino Ciampi MD PhD FESC

Delegato Regionale SIEC Campania

Napoli, 18 aprile 2015



Pibarot P *J Am Coll Cardiol* 2012

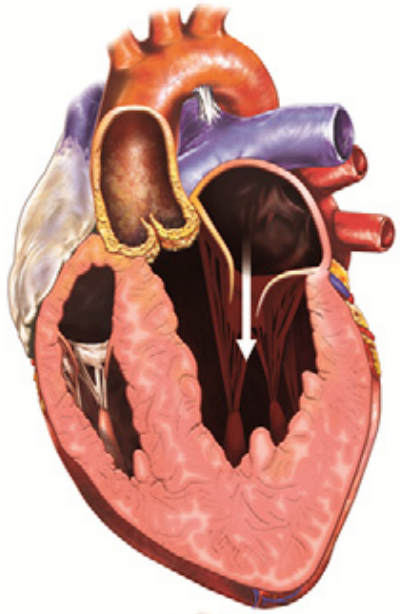
Echocardiographic criteria for the definition of severe valve stenosis: *an integrative approach*

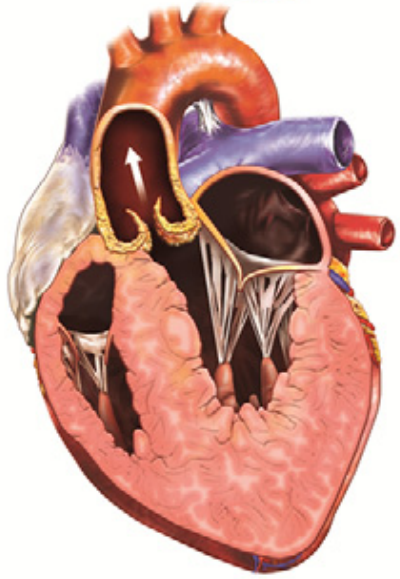
	Aortic stenosis	Mitral stenosis	Tricuspid stenosis
Valve area (cm^2)	< 1.0	< 1.0	–
Indexed valve area (cm^2/m^2 BSA)	< 0.6	–	–
Mean gradient (mmHg)	> 40	> 10	≥ 5
Maximum jet velocity (m/s)	> 4.0	–	–
Velocity ratio	< 0.25	–	–

Adapted from Baumgartner, EAE/ASE recommendations. *Eur J Echocardiogr.* 2010;10:1-25

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 -
doi:10.1093/ejcts/ezs455).

NORMAL-LVEF "PARADOXICAL" LOW-FLOW, LOW-GRADIENT





Stenosi aortica severa paradossa a basso gradiente con normale funzione sistolica

- ✓ Area valvolare aortica <1 cm^2
- ✓ Normale frazione d'eiezione (>50%)
- ✓ Stroke volume index <35 ml/m^2
- ✓ Gradiente aortico medio <40 mmHg
- ✓ $Z_{VA} \geq 5.5$ $mmHg/ml \cdot m^2$

Mito?

WIKIPEDIA
L'enciclopedia libera

Un **mito** (dal greco μύθος, *mythos*, pronuncia *mütsos*) è una narrazione investita di sacralità relativa alle origini del mondo o alle modalità con cui il mondo stesso e le creature viventi hanno raggiunto la forma presente in un certo contesto socio culturale o in un popolo specifico. Di solito i suoi protagonisti sono dei ed eroi come protagonisti delle origini del mondo in un contesto sacrale.

Spesso le vicende narrate (oralmente) nel mito hanno luogo in un'epoca che precede la storia scritta. Nel dire che il mito è una narrazione sacra s'intende che esso viene considerato verità di fede e che gli viene attribuito un significato religioso o spirituale. Ciò naturalmente non implica né che la narrazione sia vera, né che sia falsa.

Delfi, Grecia

Stenosi aortica severa paradossa a basso gradiente con normale funzione sistolica

- ✓ Area valvolare aortica <1 cm^2
- ✓ Normale frazione d'eiezione (>50%)
- ✓ Stroke volume index <35 ml/m^2
- ✓ Gradiente aortico medio <40 mmHg
- ✓ $Z_{VA} \geq 5.5$ $mmHg/ml \cdot m^2$

Table 1 Relation of the aortic valve area to the gradient

Aortic valve area (cm^2)	Mean gradient (mmHg)
4	1.7
3	2.9
2	6.6
1	26
0.9	32
0.8	41
0.7	53
0.6	73
0.5	105

Reproduced with permission from Carabello[4]. Data were derived with the Gorlin formula:

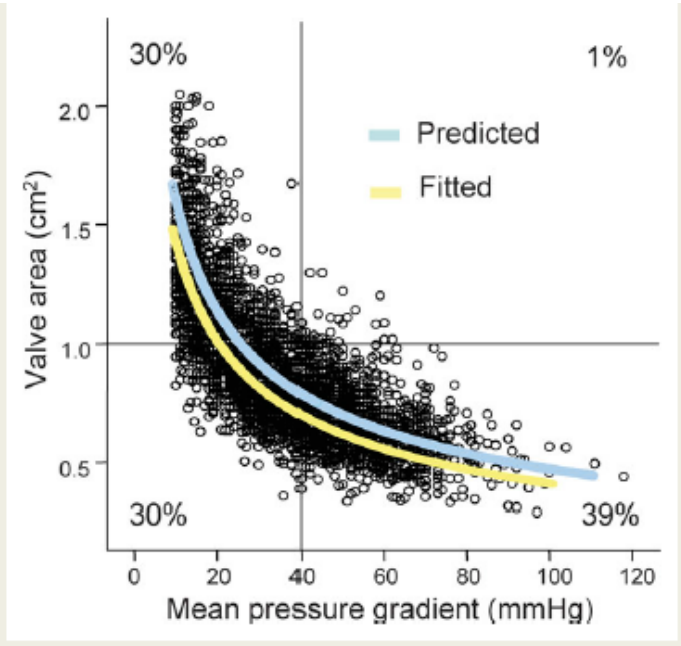
$$\text{Aortic valve area} = \frac{\text{cardiac output} \div (\text{systolic ejection period} \times \text{heart rate})}{44.3\sqrt{\text{mean gradient}}}$$

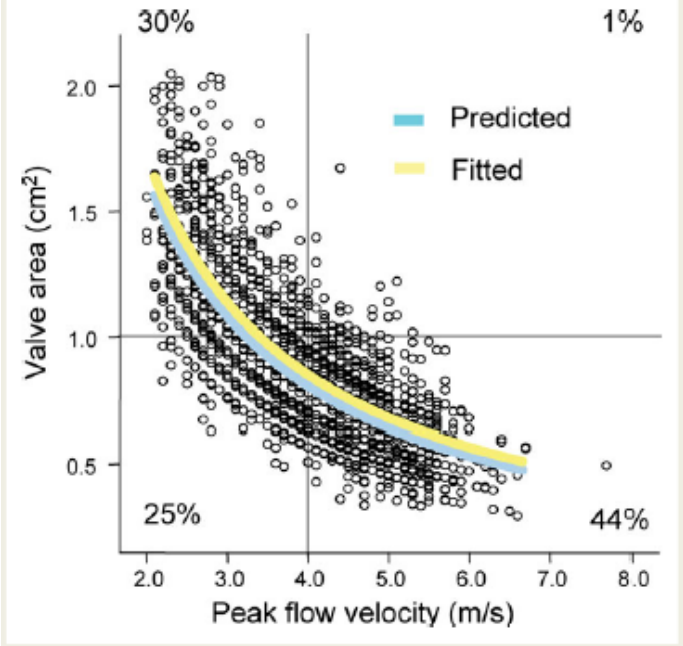
Gorlin equation, for normal cardiac output, an AVA of 1.0 cm^2 should yield a gradient of 26 mm Hg and that a gradient 40 mm Hg would correspond to an AVA of 0.75 cm^2, suggesting that a proportion of patients with LG do not really have severe AS. In other works,[5] the same authors observed that LF was thus not a necessary prerequisite for inconsistent LG and suggested an adjustment of the AVA cut-off value for severe stenosis to 0.8 cm^2. They also reported that many patients with

Dumesnil *Eur Heart J* 2010

European Heart Journal (2008) **29**, 1043–1048
doi:10.1093/eurheartj/ehm543

Inconsistencies of echocardiographic criteria for the grading of aortic valve stenosis





Consistent grading		Inconsistent grading	
AVA (cm^2)	≥1	AVA (cm^2)	≥1
ΔPm (mmHg)	≤40	ΔPm (mmHg)	>40
n	983	*n*	29
stroke volume (mL)	79 ± 15*	stroke volume (mL)	107 ± 15*
Inconsistent grading		**Consistent grading**	
AVA (cm^2)	<1	AVA (cm^2)	<1
ΔPm (mmHg)	≤40	ΔPm (mmHg)	>40
n	997	*n*	1338
stroke volume (mL)	66 ± 11*	stroke volume (mL)	70 ± 14*

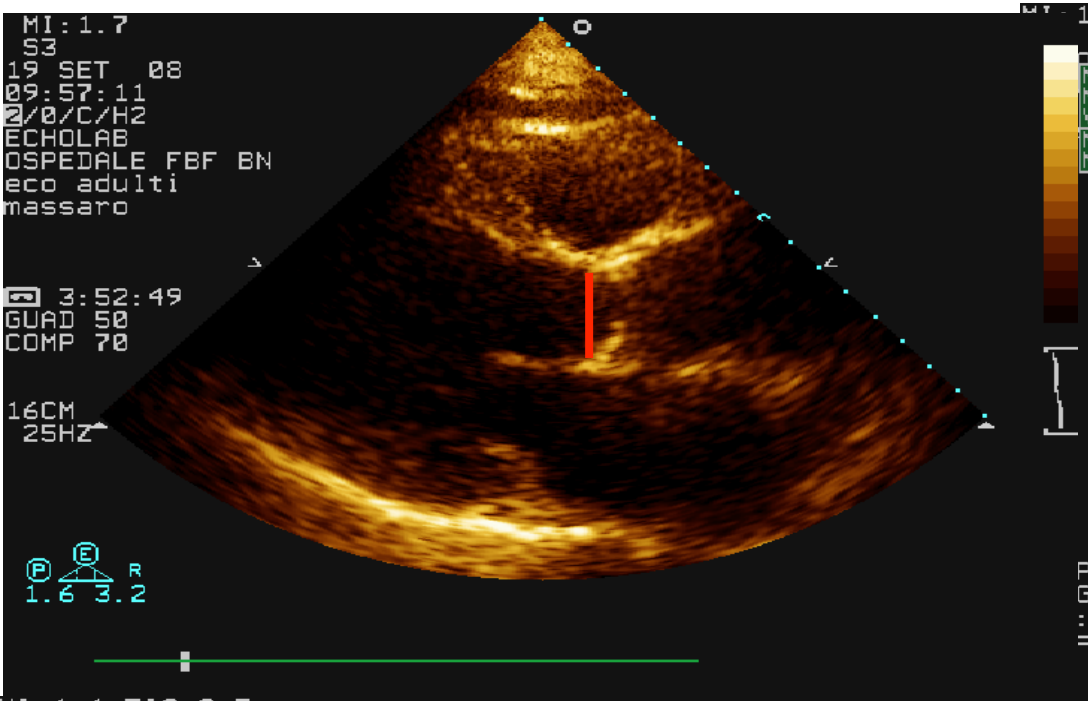
In summary, the criteria for the grading of aortic stenosis in patients with normal LV systolic function are inconsistent. On the basis of AVA, a higher proportion of patients is classified as having severe aortic valve stenosis compared with mean pressure gradient and peak flow velocity. An AVA cut-off value for severe stenosis of 0.8 cm^2 may be more appropriate. Since discrepant grading may be partly due to reduced stroke volume, every effort should be made to identify patients with low flow, low gradient aortic valve stenosis.

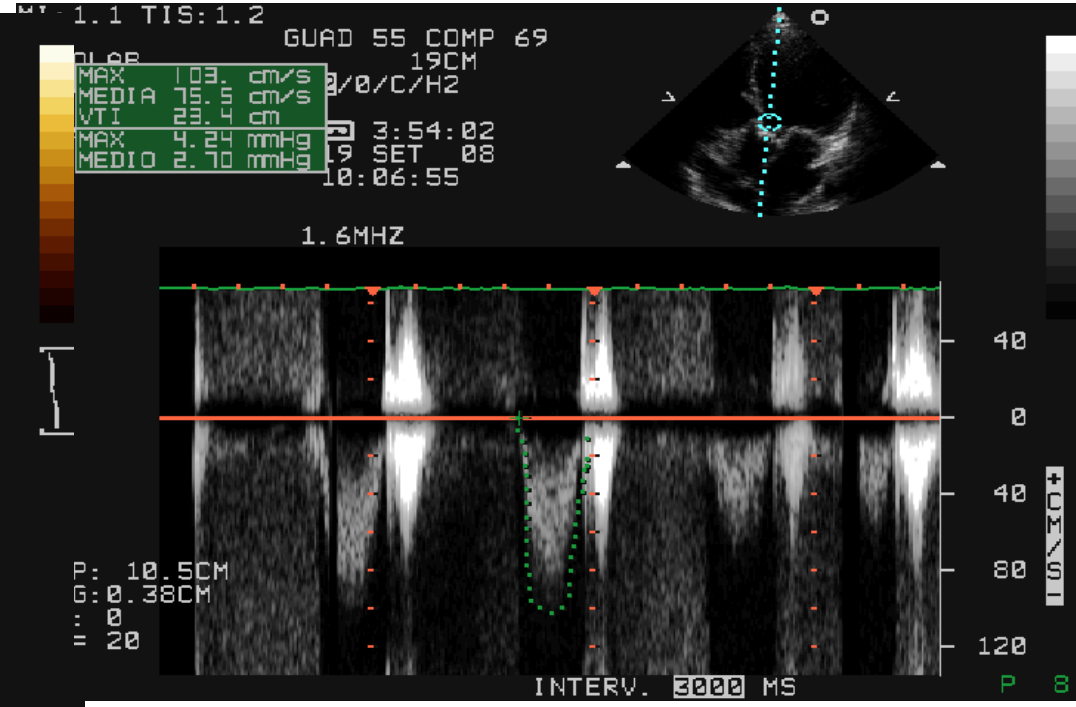
European Heart Journal (2008) **29**, 966–968
doi:10.1093/eurheartj/ehn080

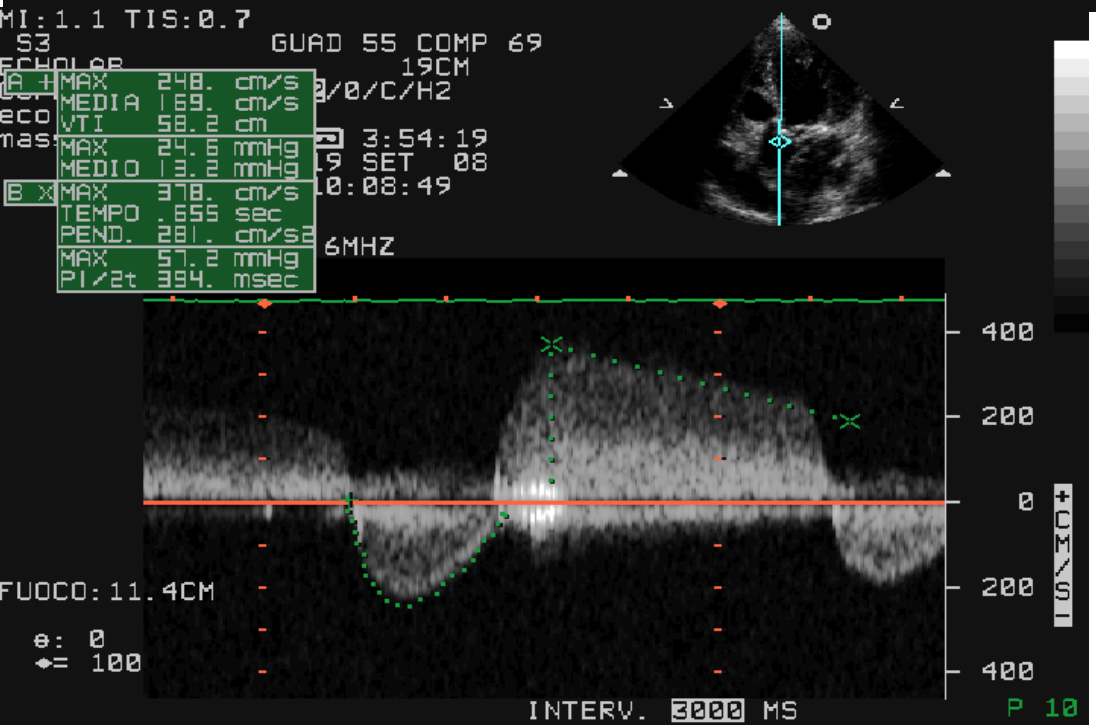
EDITORIAL

Severe aortic stenosis with low gradient and apparently preserved left ventricular systolic function—under-recognized or overdiagnosed?

Frank A. Flachskampf*







$$\text{AV area} = CSA_{OT} * \frac{TVI_{OT}}{TVI_{AS}}$$

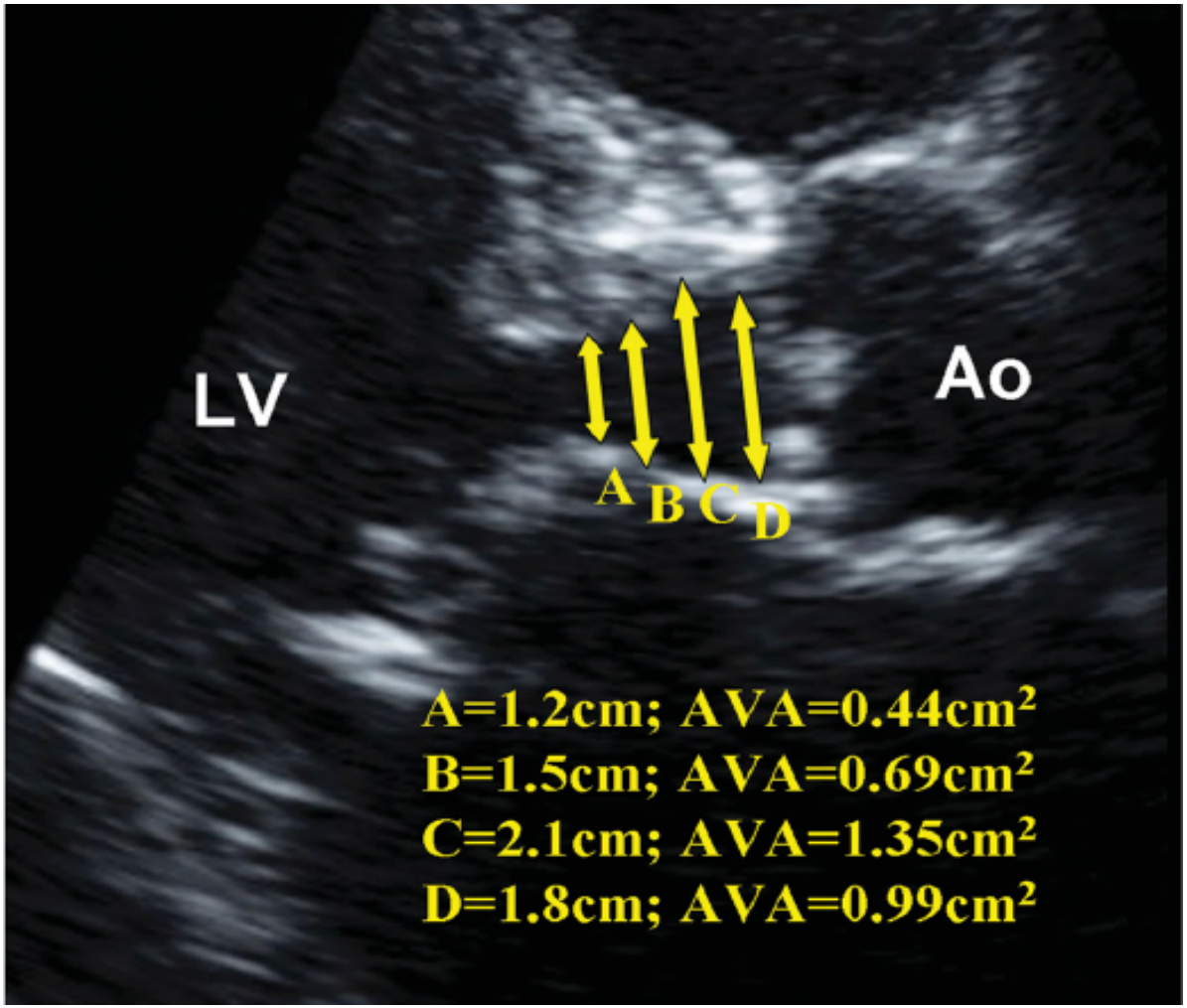
AV area= 2,2 x 23,6/58,2

0.89 cm^2

European Heart Journal (2008) 29,
doi:10.1093/eurheartj/ehn022

Assessing aortic valve area in aortic stenosis by continuity equation: a novel approach using real-time three-dimensional echocardiography

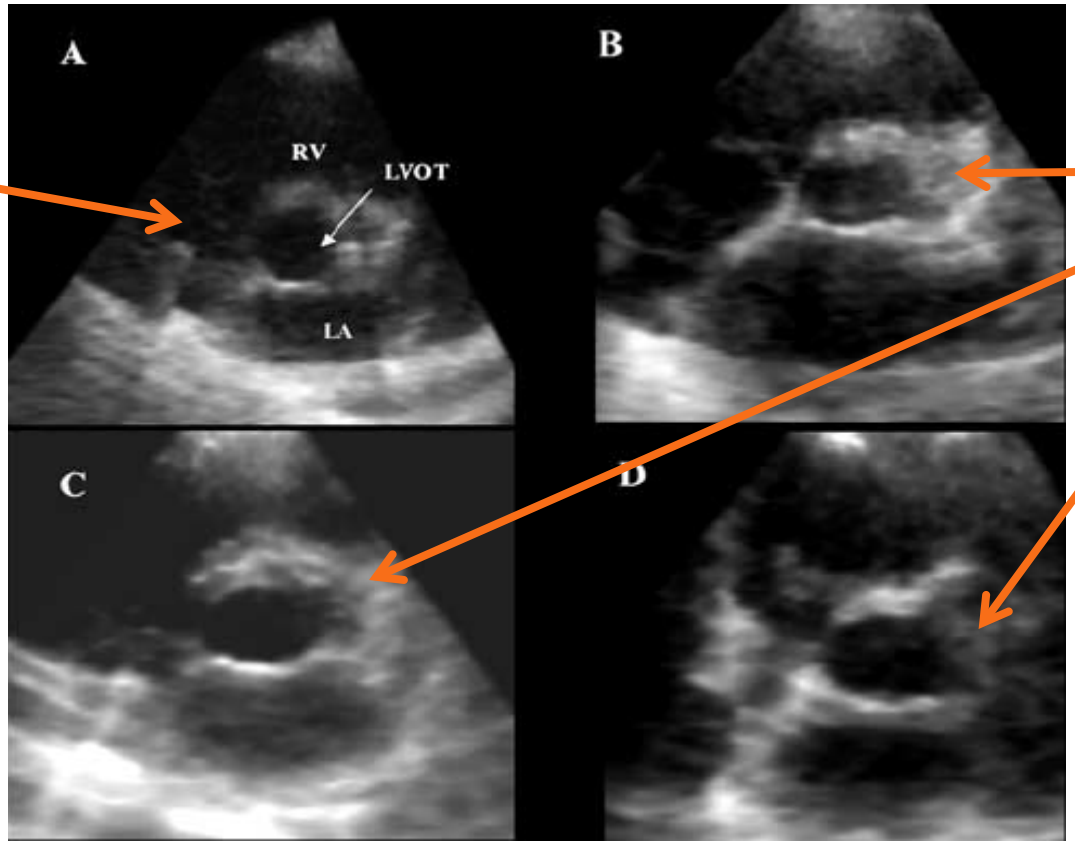
Kian Keong Poh[1,2], Robert A. Levine[1], Jorge Solis[1], Liang Shen[3], Mary Flaherty[1], Yue-Jian Kang[1], J. Luis Guerrero, and Judy Hung[1*]



Demonstration of Left Ventricular Outflow Tract Eccentricity by Real Time 3D Echocardiography: Implications for the Determination of Aortic Valve Area

Sanjay Doddamani, M.D., Ricardo Bello, M.D., Mark A. Friedman, M.D., Anita Banerjee, M.D., James H. Bowers, Jr., M.D., Bette Kim, M.D., Prashant R. Vennalaganti, M.B.B.S., Robert J. Ostfeld, M.D., Garet M. Gordon, M.D., Divya Malhotra, M.D., and Daniel M. Spevack, M.D.

Circular



Elliptical

Indications for aortic valve replacement in symptomatic aortic stenosis

	Class	Level
AVR is indicated in patients with severe AS and any symptoms related to AS.	I	B
AVR is indicated in patients with severe AS undergoing CABG, surgery of the ascending aorta or another valve.	I	C
AVR should be considered in patients with moderate AS undergoing CABG, surgery of the ascending aorta or another valve.	IIa	C
AVR should be considered in high risk patients with severe symptomatic AS who are suitable for TAVI but in whom surgery is favoured by a "heart team" based on the individual risk profile and anatomic suitability	IIa	B
AVR should be considered in symptomatic patients with low flow, low gradient (< 40 mmHg) AS with normal EF only after careful confirmation of severe AS.	IIa	C
AVR should be considered in symptomatic patients with severe AS, low flow, low gradient with reduced EF, and evidence of flow reserve.	IIa	C
AVR may be considered in symptomatic patients with severe AS low flow, low gradient, and LV dysfunction without flow reserve.	IIb	C

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 -
doi:10.1093/ejcts/ezs455).

Careful confirmation LF LG AS

Parameter	Criteria for Severe	Utility and Advantages	Limitations
Quantification of valvular obstruction			
Peak aortic jet velocity (V_{Peak})*†	>4 m/s	Easy to measure Low interobserver/intraobserver variability High specificity	Highly flow dependent Over-estimates LV energy loss in patients with small aortas May under- or over-estimate stenosis severity in presence of hypertension Under-estimates stenosis severity in low flow states
Mean gradient*†	>40 mm Hg	Same as peak aortic jet velocity	Same as peak aortic jet velocity
Valve effective orifice area*† EOA = SV_{LVOT}/VTI_{Ao} Indexed EOA* EOAI = EOA/BSA	≤1.0 cm^2 ≤0.6 cm^2/m^2	Less flow dependent than gradient or peak velocity Reflects intrinsic severity of valvular obstruction	Susceptible to measurements errors Over-estimates LV energy loss in patients with small aortas May under- or over-estimate stenosis severity in presence of hypertension May over-estimate stenosis severity in low flow states EOA may over-estimate severity in patients with small body size. Indexed EOA may over-estimate severity in obese patients

Pibarot P *J Am Coll Cardiol* 2012

Parameter	Criteria for Severe	Utility and Advantages	Limitations
Quantification of global LV hemodynamic load			
Valvuloarterial impedance (Z_{va})*	>4.5 mm Hg·ml^{-1}·m^2	Can be measured by Doppler echocardiography	Susceptible to measurements errors
$Z_{va} = SBP + \Delta P_{Mean}/SVI$		Reflects global (valvular+arterial) load imposed on LV	Does not permit to discriminate the valvular versus the arterial contribution to the global LV load
		Potentially superior to predict occurrence of symptoms and events	
Quantification of LV systolic dysfunction			
LVEF*†	<50%	Widely used and validated with regard to outcome data	Susceptible to measurements errors Also influenced by LV geometry
			Under-estimates the degree of myocardial systolic dysfunction in presence of LV concentric remodeling
Global longitudinal strain*	<15%	Less influenced by LV geometry	Cutoff values need to be further validated
		Superior to LVEF to assess intrinsic myocardial function	
Myocardial fibrosis		Can be measured by CMR	High cost and low availability of CMR
		Predicts poor outcomes after AVR	
Plasma natriuretic peptides* BNP or NT-ProBNP		Easy and inexpensive to measure Reflects total burden of disease on myocardium	High variability in the threshold values reported in the literature to predict poor outcomes
		Correlates well with myocardial systolic dysfunction and symptoms	Increase in BNP during serial follow-up may be superior to isolated measure
		Predicts poor outcomes before and after AVR	Does not permit discriminating impact of valvular stenosis versus hypertension versus other cardiovascular disease
			NT-ProBNP may be more sensitive to detect early LV systolic dysfunction but more age dependent

Pibarot P *J Am Coll Cardiol* 2012

Stenosi aortica severa paradossa a basso gradiente con normale funzione sistolica

- ✓ Area valvolare aortica <1 cm^2
- ✓ Stroke volume index <35 ml/m^2
- ✓ Normale frazione d'eiezione (>50%)
- ✓ Gradiente aortico medio <40 mmHg
- ✓ $Z_{VA} \geq 5.5$ $mmHg/ml \cdot m^2$

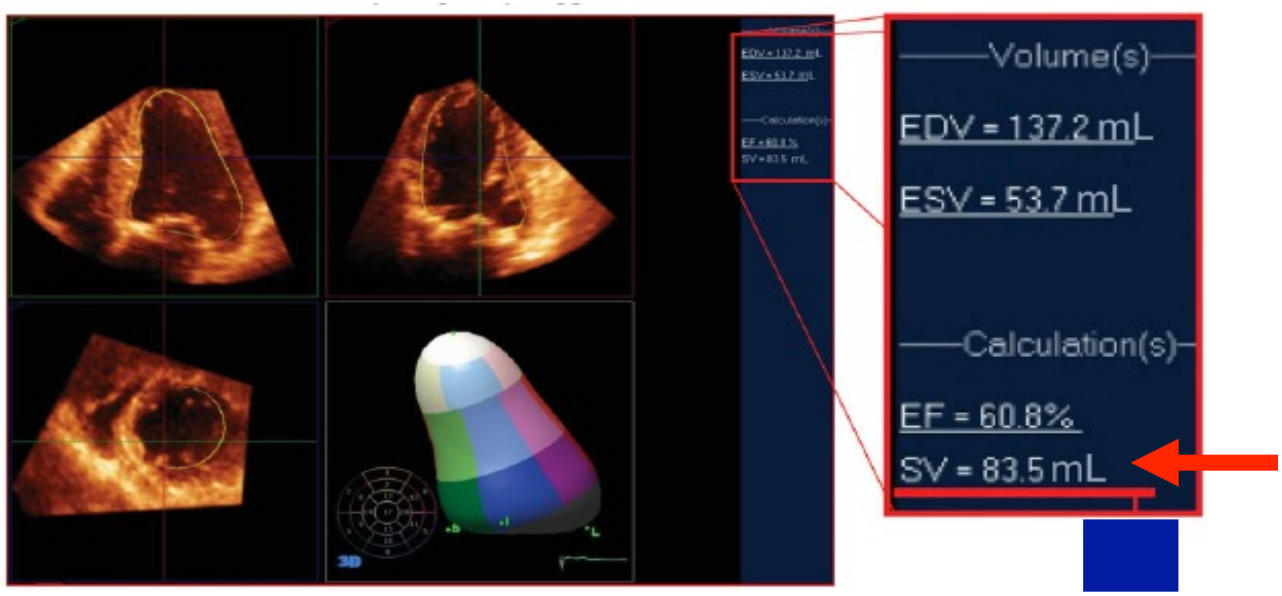
METODI DI CALCOLO DELLO SV

METODO DEI VOLUMI

SV (ml) = VTD (ml) – VTS (ml)

- Richiede l'eco 3D-RT per una stima accurata dei volumi.
- Non è applicabile in presenza di insufficienza mitralica o DIV (sovrastima lo SV anterogrado).
- Immagini di cattiva qualità pregiudicano l'accuratezza del risultato.

ECO 3D



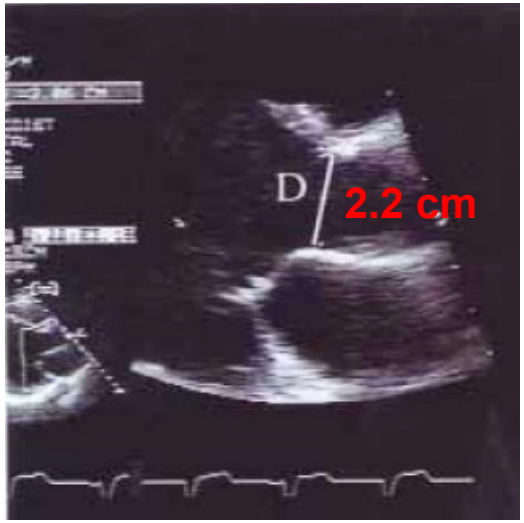
METODI DI CALCOLO DELLO SV - II

METODO ECO-DOPPLER

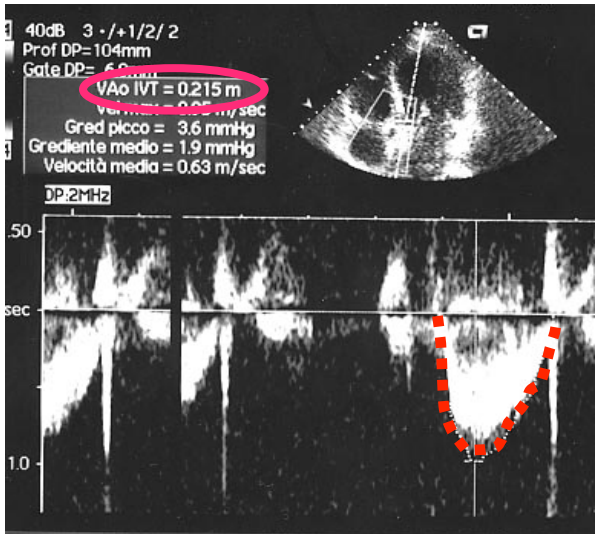
SV (ml) = area valvola aortica (cm^2) x ITV eiezione aortica (cm)

- Assume che l'area della valvola aortica non cambi durante la sistole.
- Non è applicabile in presenza di stenosi aortica (di qualunque grado) e altre ostruzioni all'efflusso ventricolare sinistro.

Parasternale asse lungo



Diametro alla base dei lembi aortici



Apicale 4-camere con aorta

Doppler pulsato

Integrale flusso aortico

$$SV = 0.785 \cdot D^2 \cdot ITV = 0.785 \cdot (1.1\ cm)^2 \cdot 21.5\ cm = 81.7\ ml$$

SV ANTEROGRADO CON METODO ECO-DOPPLER

Poiché il raggio è elevato al quadrato, errori di 1 mm nella misura del diametro variano sensibilmente lo SV:

$$SV = 0.785 \cdot (2.3\ cm)^2 \cdot 21.5\ cm = 89.3\ ml\ (+9\%\ circa)$$
$$SV = 0.785 \cdot (2.2\ cm)^2 \cdot 21.5\ cm = 81.7\ ml$$
$$SV = 0.785 \cdot (2.1\ cm)^2 \cdot 21.5\ cm = 74.4\ ml\ (-9\%\ circa)$$

ACCORGIMENTI E LIMITI

- Ingrandire il tratto di efflusso con lo zoom.
- Misurare il diametro alla base dei lembi a valvola aperta (protosistole).
- Evitare la misura su immagini di cattiva qualità o lesioni calcifiche (che pregiudicano una corretta misurazione del diametro).
- Porre il volume campione del Doppler PW a livello dell'anello aortico.
- Tracciare lungo il contorno esterno della parte più densa (più brillante) della curva Doppler spettrale.
- In ritmo sinusale usare la media di 3-5 battiti.
- In studi seriali (ripetuti nel tempo) usare il diametro misurato nel primo studio.

SV ridotto in soggetti normali

	Severe AS, EF ≥50% (n=128)				
	High Gradient (n=97)		Low Gradient (n=31)		
Variables	Normal Flow (HG/NF—Group I; n=69)	Low Flow (HG/LF—Group II; n=28)	Normal Flow (LG/NF—Group III; n=17)	Low Flow (LG/LF Group IV; n=14)	Healthy Volunteers (n=20)
SVI, mL/m²	44±7[II,III,IV,C]	31±3[I,III]	38±4[I,I,IV]	31±2[I,III]	35±7[I]

Our study suggests also that the criteria for low flow, that is, SVI ≤35 mL/m², might not, per se, be a sign of abnormality because a large proportion of our normal-aged volunteers had SVI less than

Barone-Rochette G *Circ Cardiovasc Imag* 2013

SV si riduce con l'età

Furthermore, cardiac output decreases with age, with a 'normal' value for those over 70 years old cited as 2.5 L/(min m^2).[5] The reasons for this have been ascribed to a lower metabolic rate with increasing age, but may also be due to increased peripheral resistance, arterial stiffening, and other factors.[6]

Flachskampf FA *Eur Heart J* 2008

Paradoxical Low-Flow, Low-Gradient Severe Aortic Stenosis Despite Preserved Ejection Fraction Is Associated With Higher Afterload and Reduced Survival

Zeineb Hachicha, Jean G. Dumesnil, Peter Bogaty and Philippe Pibarot

Circulation 2007

TABLE 3. Predictors of Overall Death on Univariate and Multivariate Analysis

Variable	Percentage of Patients With Variable	Univariate Analysis		Multivariate Analysis	
		P	Hazard Ratio (95% CI)	*P*	Hazard Ratio (95% CI)
Age	100	<0.0001	1.06 (1.04 to 1.1)	0.025	1.04 (1.01 to 1.08)
Hypertension	70	0.02	2.0 (1.1 to 3.8)	NS	. . .
LVEF ≤55%*	12	0.02	2.1 (1.2 to 3.7)	NS	. . .
Stroke volume index ≤35, $mL \cdot m^{-2}$	35	0.01	1.9 (1.2 to 3.0)	NS	. . .
Systemic arterial compliance ≤0.6, $mL \cdot mm\ Hg^{-1} \cdot m^{-2}$	38	0.04	1.7 (1.1 to 3.4)	NS	. . .
Valvulo-arterial impedance ≥5.5, $mm\ Hg \cdot mL^{-1} \cdot m^{-2}$	14	0.006	2.5 (1.2 to 4.5)	0.017	2.6 (1.2 to 5.7)
Medical treatment (vs surgical treatment)	70	<0.0001	4.3 (2.6 to 7.4)	0.0003	3.3 (1.8 to 6.7)

Characteristic	Surgical Group (N=22)	Nonsurgical Group (N=106)	P Value
Female sex — no. (%)	11 (50)	48 (45)	NS
Age — yr			
Mean	71±12	57±19	<0.001
Range	37–88	15–87	

Rosenek R *N Engl J Med* 2000

TABLE 1. Clinical and Resting Echocardiographic Variables Accordi Outcome

Variables	No Event (n=51)	Event (n=18)
Clinical		
Age (years)	65±14	69±7

Lancellotti P *Circulation* 2005

TABLE 1. Characteristics of Patients*

Variable	(n=622)
Age, y	72±11

Pellikka P *Circulation* 2006

Table 1 Patient characteristics according to the appearance of e

	Mean	*SD*
Age (years)	44.2	13.7
	53.7	14.7

Amato P *Heart 2001*

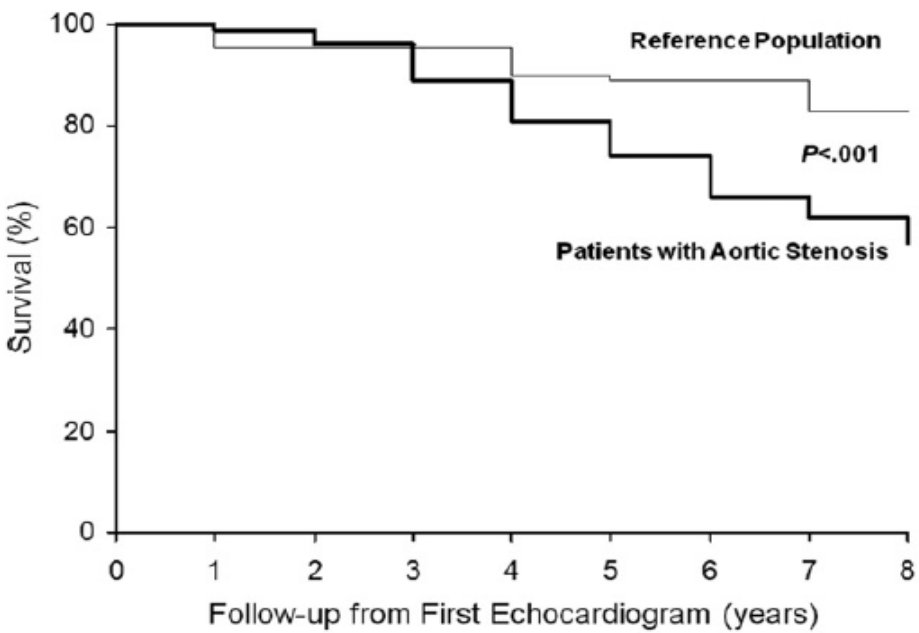
Hemodynamic Progression and Outcome of Asymptomatic Aortic Stenosis in Primary Care

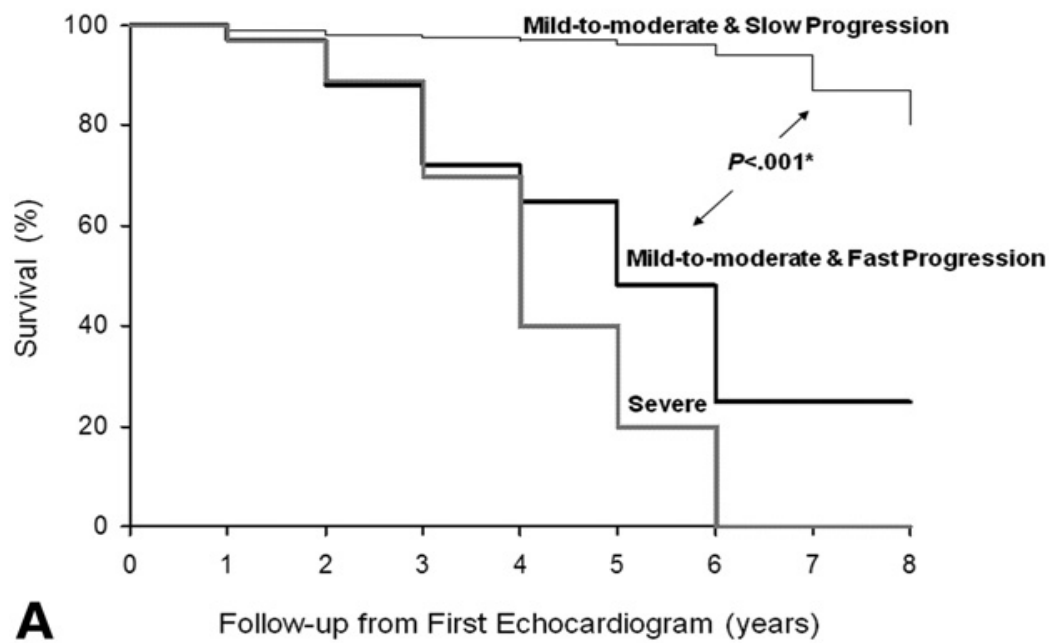
Stefano Nistri, MD, PhD[a,*], Pompilio Faggiano, MD[b], Iacopo Olivotto, MD[c], Barbara Papesso, MD[a], Tania Bordonali, MD[b], Giorgio Vescovo, MD[d], Livio Dei Cas, MD[b], Franco Cecchi, MD[c], and Robert O. Bonow, MD[e]

Am J Cardiol 2012;109:718–723

Variable	Overall (n = 153)	Slow Progression (n = 104)	Fast Progression (n = 49)
Men	85 (65%)	64 (62%)	21 (43%)
Age (years)	77 ± 1.9	76 ± 9	77 ± 9

Fast progression: >0.3 m/s anno





A

Outcomes in Patients With Various Forms of Aortic Stenosis Including Those With Low-Flow Low-Gradient Normal and Low Ejection Fraction

Romero J *Am J Cardiol* 2014

Table 1
Baseline characteristics for patient groups

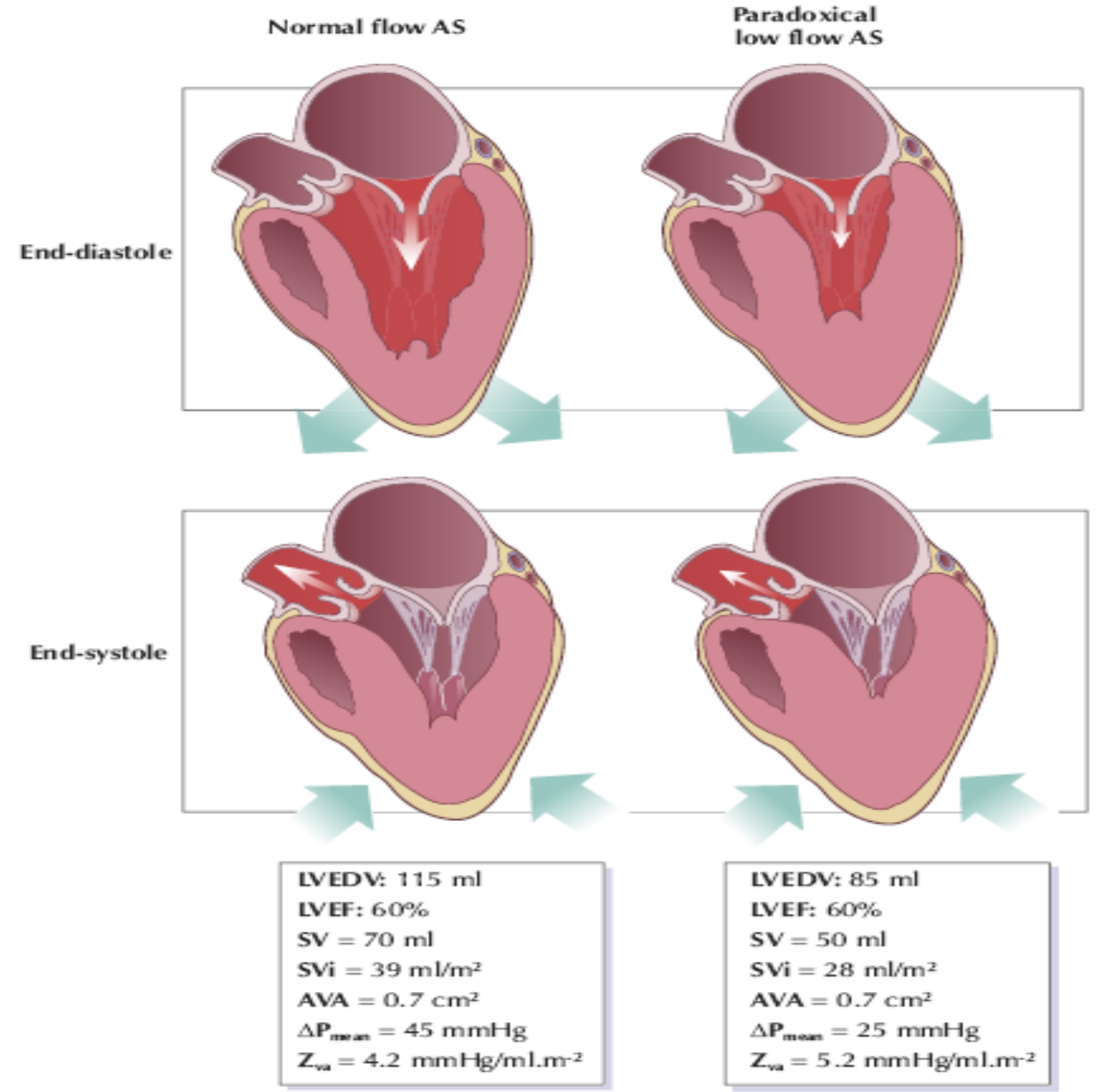
Variable	Mild (N = 594)	Moderate (N = 2958)	Severe (N = 500)	LFLGNEF (N = 776)	LFLGLEF (N = 318)	p Value
Age (years)	74.3 ± 11.4	77.2 ± 12.5	78 ± 12.9	80.5 ± 11.4	78.5 ± 11.8	<0.001
Men	275 (46%)	906 (38%)	181 (36%)	237 (31%)	163 (51%)	<0.001
Hypertension	356 (60%)	1360 (58%)	267 (53%)	445 (57%)	153 (48%)	0.005
Hyperlipidemia	176 (30%)	636 (27%)	123 (25%)	204 (26%)	71 (22%)	0.141
Coronary artery disease	226 (38%)	1065 (45%)	252 (50%)	367 (47%)	185 (58%)	<0.001
Diabetes mellitus	185 (31%)	724 (31%)	115 (23%)	209 (27%)	85 (27%)	0.004
Stroke	70 (12%)	270 (11%)	35 (7%)	94 (12%)	33 (10%)	0.039
Peripheral artery disease	30 (5%)	111 (5%)	12 (2%)	28 (4%)	25 (8%)	0.004
Chronic kidney disease	123 (21%)	446 (19%)	69 (14%)	132 (17%)	70 (22%)	0.01
Chronic obstructive pulmonary disease	54 (9%)	198 (8%)	38 (8%)	66 (9%)	19 (6%)	0.539
Smoker	25 (4%)	77 (3%)	16 (3%)	29 (4%)	6 (2%)	0.422
Echocardiographic data						
Aortic valve area (cm^2)	1.73 ± 0.20	1.23 ± 0.20	0.63 ± 0.20	0.78 ± 0.10	0.72 ± 0.20	<0.001
Mean gradient (mm Hg)	12 ± 4	27 ± 10	54 ± 12	27 ± 8	24 ± 9	<0.001
Stroke volume indexed (ml/m^2)	—	—	—	32 ± 14	27 ± 11	0.018
Ejection fraction (%)	60 ± 10	59 ± 12	59.7 ± 12	63 ± 6	35 ± 10	<0.001

Hemodynamic Progression and Outcome of Asymptomatic Aortic Stenosis in Primary Care

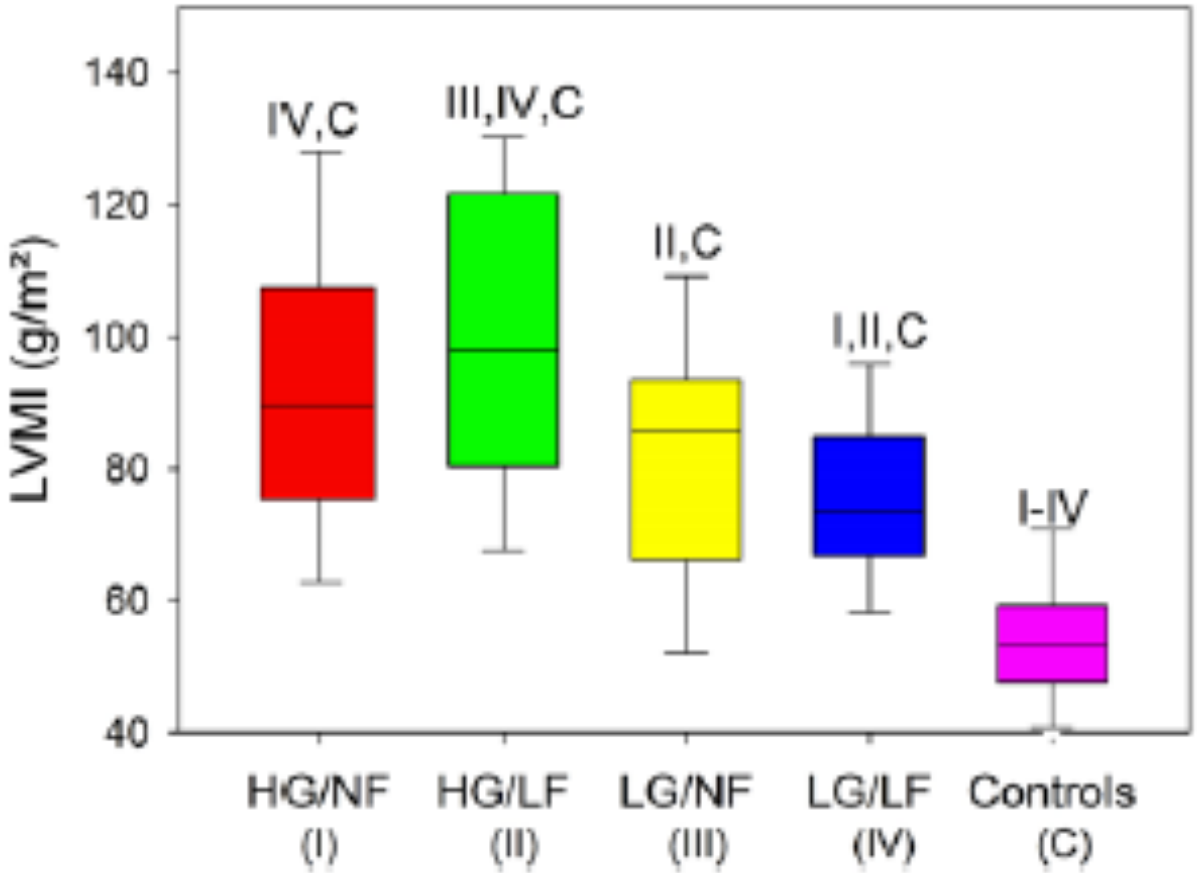
Stefano Nistri, MD, PhD[a,*], Pompilio Faggiano, MD[b], Iacopo Olivotto, MD[c], Barbara Papesso, MD[a], Tania Bordonali, MD[b], Giorgio Vescovo, MD[d], Livio Dei Cas, MD[b], Franco Cecchi, MD[c], and Robert O. Bonow, MD[e]

Am J Cardiol 2012;109:718–723

in cohorts reported from tertiary referral centers.[9] In our patient population, the annual rate of progression of AS was frequently very rapid, particularly among patients with only mild-to-moderate AS at baseline. Importantly, the rate of progression proved to be an independent predictor of overall mortality and AVR. Of note, our patients were older than those enrolled in most studies from the tertiary centers[5–10]; nevertheless, the mortality rate of our asymptomatic patients was greater than that in the general population when matched to the age and gender demographics of our population.



Pibarot P, et al *JACC imag* 2009



remodeling. On the contrary, we found that indexed mass and wall thickness by CMR were less in LG AS, indicating that remodeling in these patients is reduced rather than increased, and that maladaptive hypertrophy[25] cannot be held responsible to explain LG in AS. It is noteworthy that this absence of significant difference in LV mass in patients with LG AS was also reported by others.[26]

Barone-Rochette G *Circ Cardiovasc Imag* 2013

Low-Gradient Aortic Valve Stenosis

Myocardial Fibrosis and Its Influence on Function and Outcome

Sebastian Herrmann, MD,*† Stefan Störk, MD, PHD,*† Markus Niemann, MD,*†
Volkmar Lange, MD,§ Jörg M. Strotmann, MD,* Stefan Frantz, MD,*† Meinrad Beer, MD,†‖
Stefan Gattenlöhner, MD,‡ Wolfram Voelker, MD,*† Georg Ertl, MD,*† Frank Weidemann, MD*†

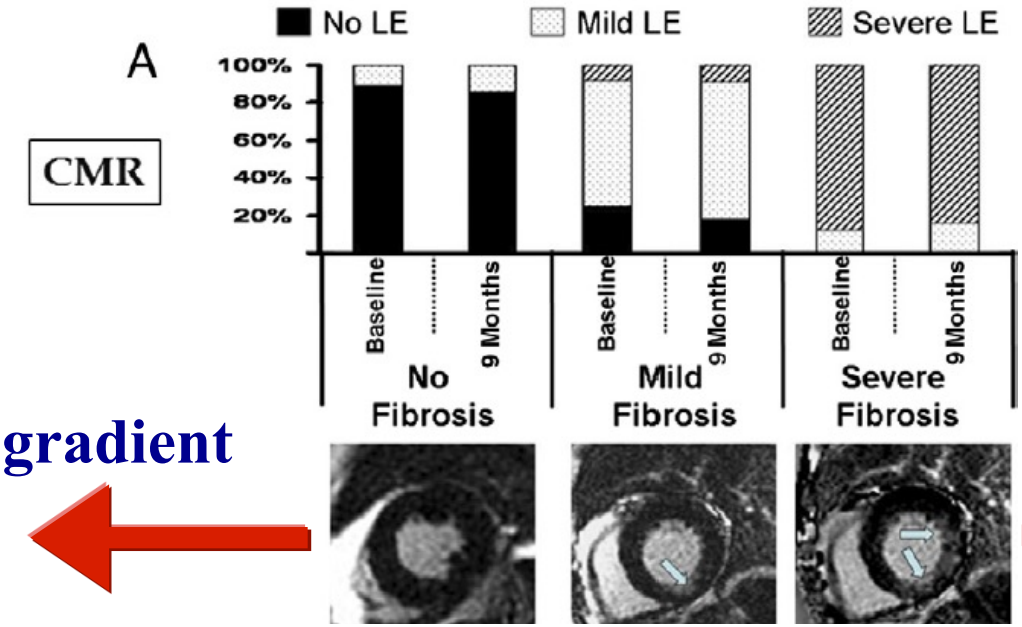
	Severe AS, High Gradient (n = 49)	Severe AS, Low Gradient, EF ≥50% (n = 11)	Severe AS, Low Gradient, EF <50% (n = 9)
cMRI			
Ejection fraction, %	55 ± 13	56 ± 12	38 ± 17*†
Late enhancement–positive segments: 0/1/>1, %	47/19/34	0/20/80	0/23/77
Myocardial histology			
Interstitial fibrosis, %	1.8 ± 0.8	3.9 ± 0.6*	4.8 ± 0.6*
Myocyte diameter, μm	12.2 ± 1.3	13.1 ± 1.5	13.7 ± 1.3*
Cardiac biomarkers			
NT-proBNP, pg/ml	1,418 (377–1,505)	3,730 (1,858–5,671)*	5,016 (4,182–5,704)*
PIIINP, μg/ml	3.4 ± 0.8	4.6 ± 0.4	5.0 ± 1.3*

Herrmann S *J Am Coll Cardiol* 2011

our present study, using delayed enhancement CMR, we did not find increased amounts of focal fibrosis in patients with LG/LF AS. Also, we did not observe that LG/LF AS has reductions of CMR EF, a precise method for evaluation of systolic function usually well correlated with strain.[29]

	Severe AS, EF ≥50% (n=128)		
Variables	High Gradient (n=97)	Low Gradient (n=31)	*P*
Scar, %	1.6±3.5, 0.43 (0.18–1.22)	0.9±1.0, 0.51 (0.24–1.20)	0.97 (NS)

Barone-Rochette G *Circ Cardiovasc Imag* 2013

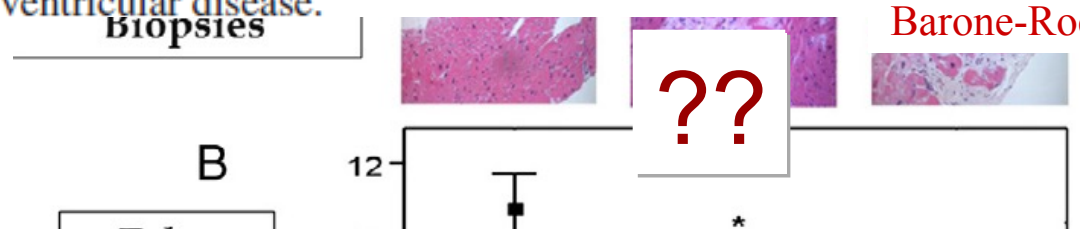


Low flow low gradient

Low flow low gradient

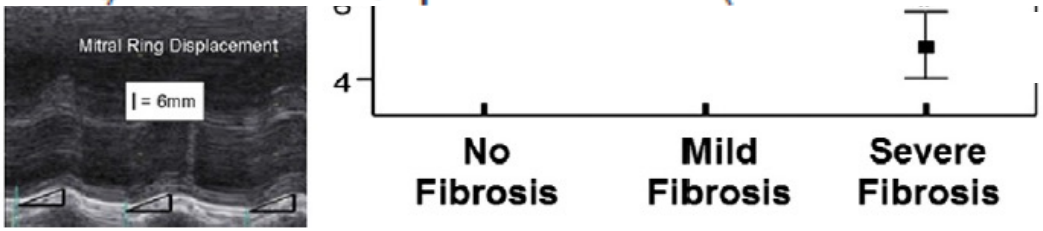
was accurate overall. However, patients with low gradient AS had less severe, rather than more severe, AS, less left ventricular hypertrophy and remodeling, and similar amounts of focal fibrosis compared with high gradientAS. This questions our current view of paradoxical low flow low gradient AS and suggests that this condition is a less rather than a more advanced state of valvular and ventricular disease.

Barone-Rochette G *Circ Cardiovasc Imag* 2013



In severe AS, a low gradient is associated with a higher degree of fibrosis, decreased longitudinal function, and poorer clinical outcome despite preserved EF. Mitral ring displacement differentiates between moderate AS and low-gradient/severe AS with preserved EF. (J Am Coll Cardiol 2011;58:402–12) © 2011 by the

Herrmann S *J Am Coll Cardiol* 2011



Pibarot P *J Am Coll Cardiol* 2012

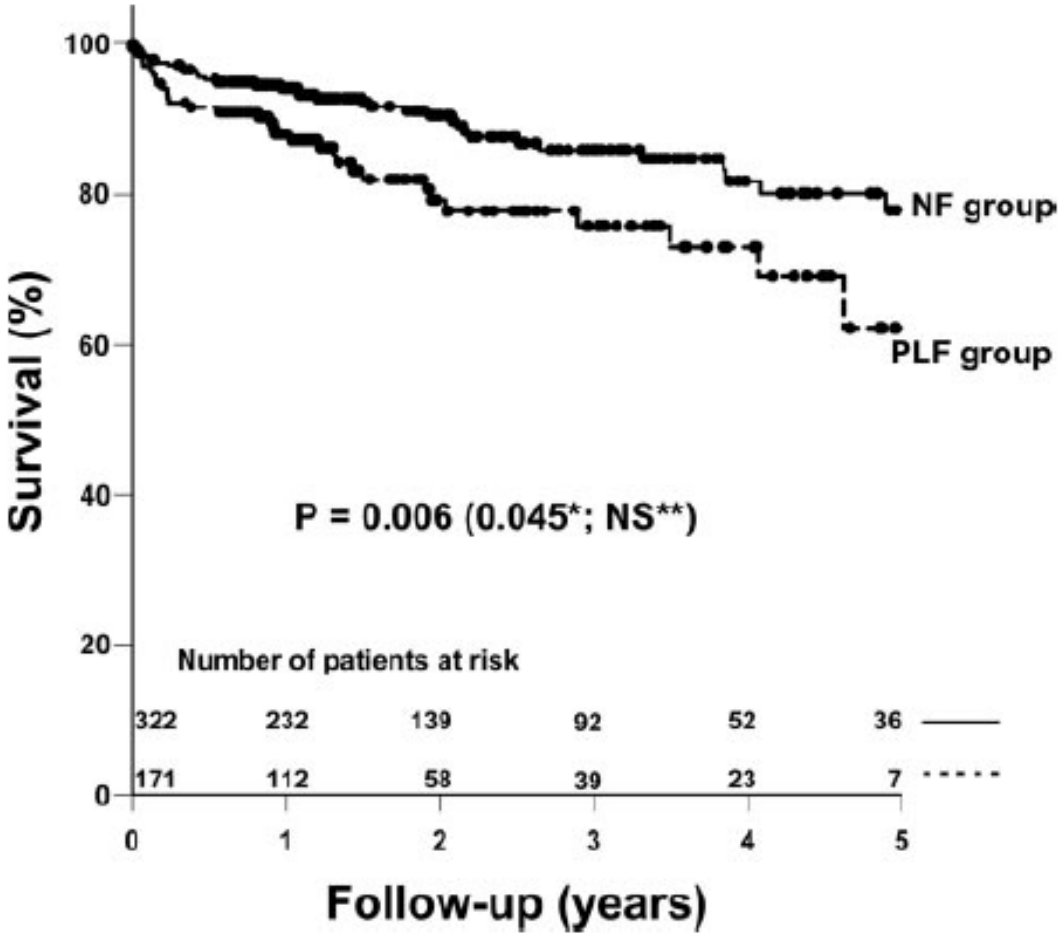
Paradoxical Low-Flow, Low-Gradient Severe Aortic Stenosis Despite Preserved Ejection Fraction Is Associated With Higher Afterload and Reduced Survival

Zeineb Hachicha, Jean G. Dumesnil, Peter Bogaty and Philippe Pibarot

Circulation 2007

512 pts

Group NF	Group PLF
SVI > 35 ml/m²	SVI ≤ 35 ml/m²
N =331 (65%)	N = 181 (35%)

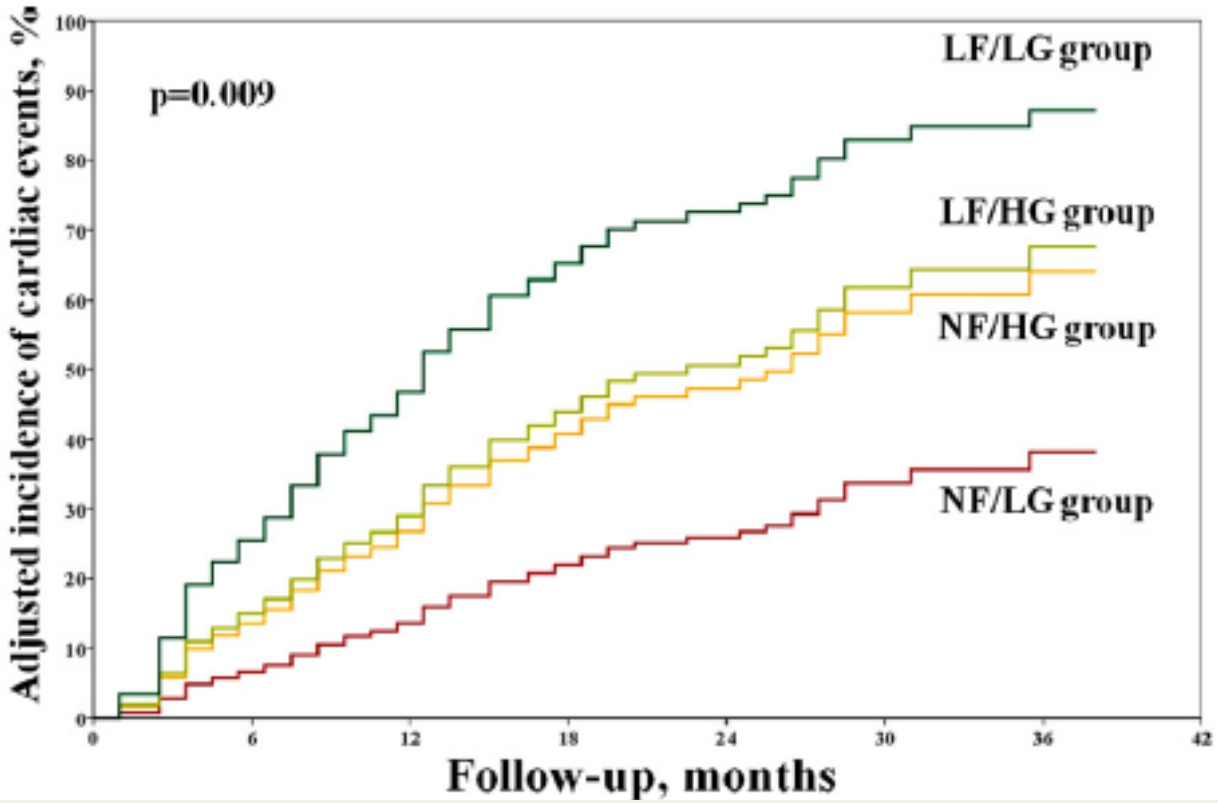


Conclusion—Patients with severe aortic stenosis may have low transvalvular flow and low gradients despite normal LV ejection fraction. A comprehensive evaluation shows that this pattern is in fact consistent with a more advanced stage of the disease and has a poorer prognosis. Such findings are clinically relevant because this condition may often be misdiagnosed, which leads to a neglect and/or an underestimation of symptoms and an inappropriate delay of aortic valve replacement surgery. (*Circulation*. 2007;115:2856-2864.)

Clinical Outcome in Asymptomatic Severe Aortic Stenosis

Insights From the New Proposed Aortic Stenosis Grading Classification

Patrizio Lancellotti, MD, PHD,* Julien Magne, PHD,* Erwan Donal, MD, PHD,† Laurent Davin, MD,* Kim O'Connor, MD,*‡ Monica Rosca, MD,* Catherine Szymanski, MD,* Bernard Cosyns, MD, PHD,§



150 pts

NF/LG (referent)	1.00	1.00–1.00	NA	1.00	1.00–1.00	NA
NF/HG	1.01	0.42–2.38	0.38	2.12	0.80–5.83	0.14
LF/HG	1.51	0.74–3.12	0.08	2.24	1.02–5.47	0.043
LF/LG	4.54	1.99–11.1	0.001	5.22	2.02–14.1	0.001

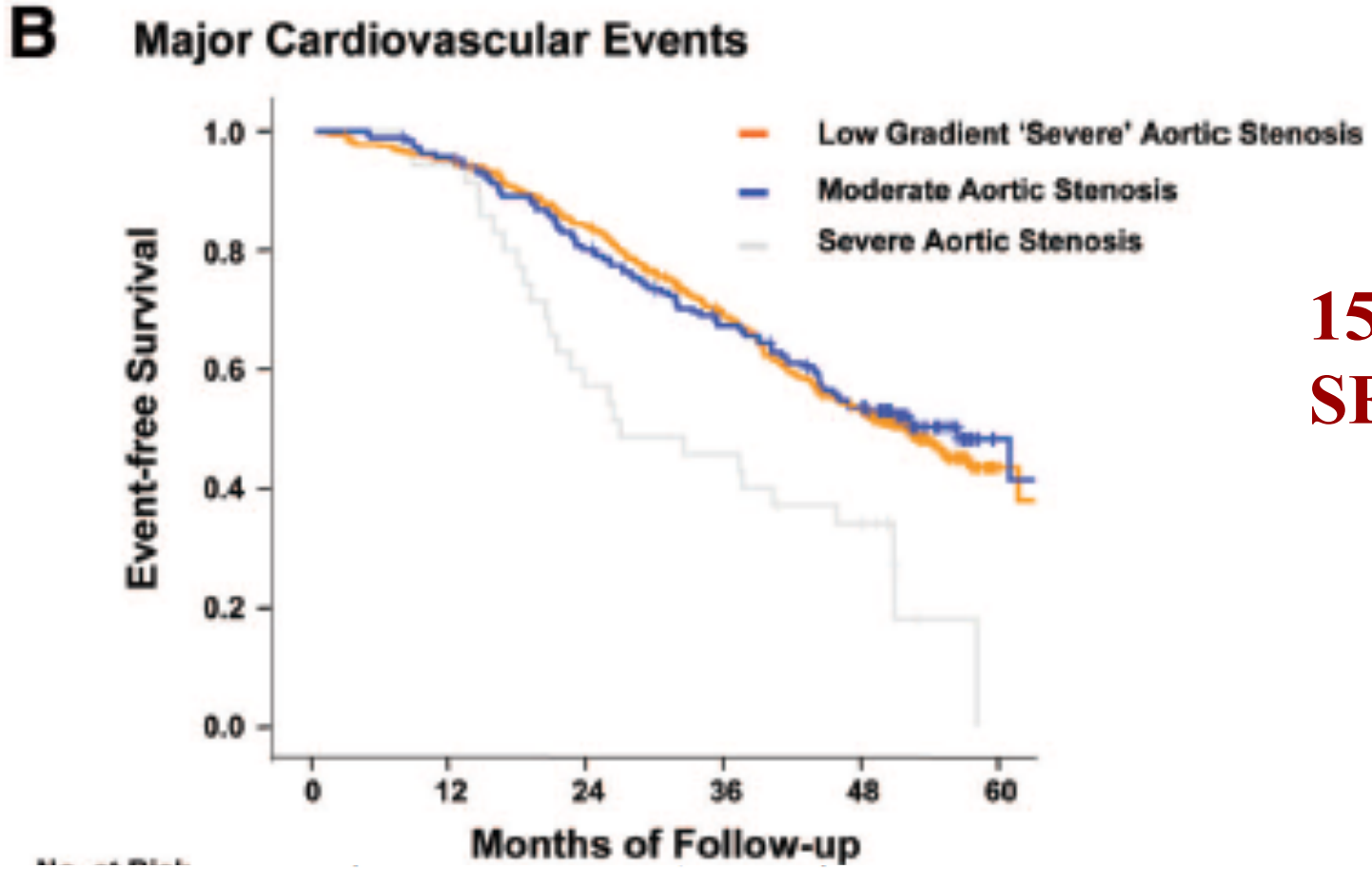
Lancellotti P *J Am Coll Cardiol* 2012

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association

Outcome of Patients With Low-Gradient "Severe" Aortic Stenosis and Preserved Ejection Fraction

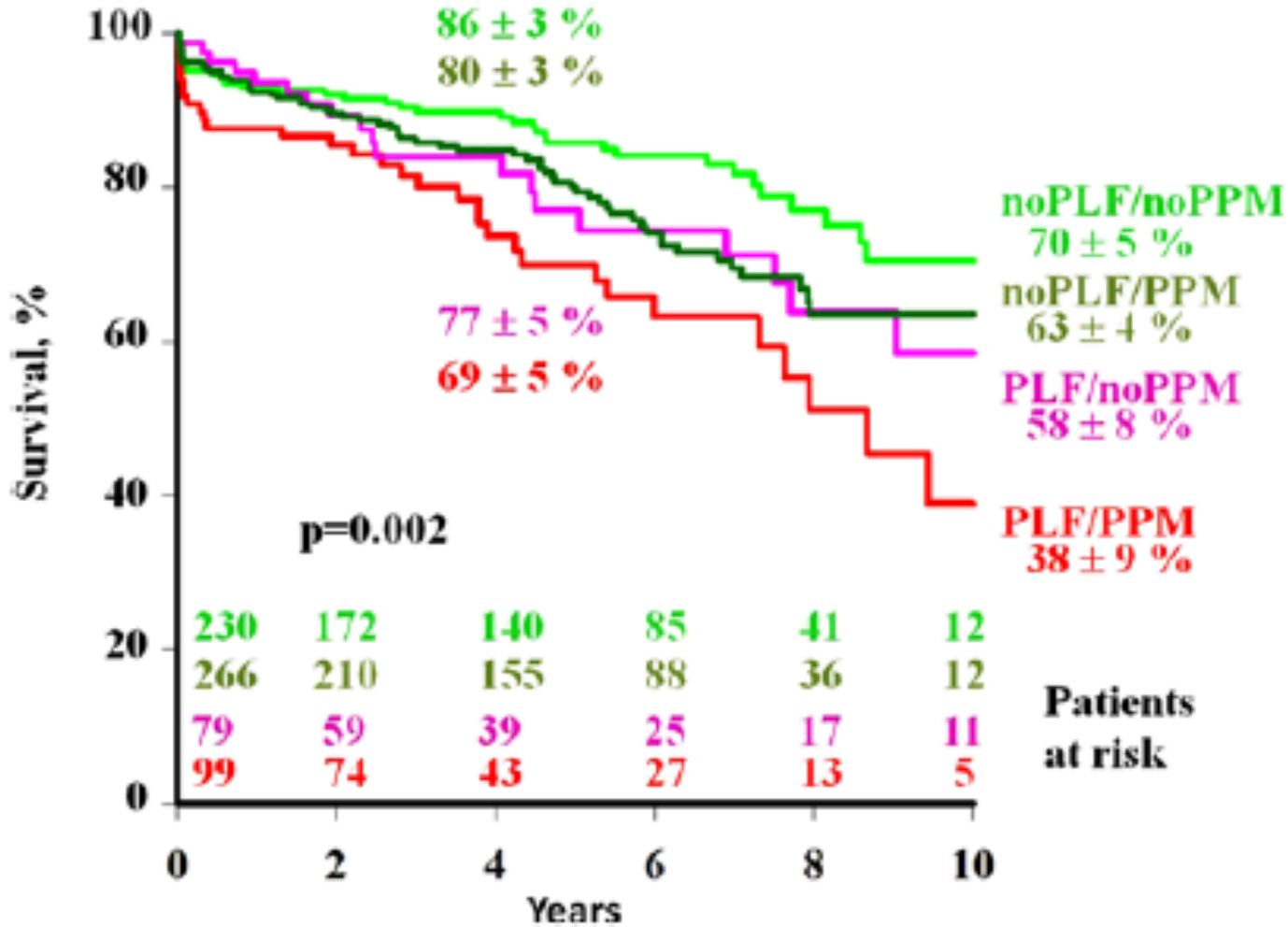
Nikolaus Jander, Jan Minners, Ingar Holme, Eva Gerdts, Kurt Boman, Philippe Brudi, John B. Chambers, Kenneth Egstrup, Y. Antero Kesäniemi, William Malbecq, Christoph A. Nienaber, Simon Ray, Anne Rossebø, Terje R. Pedersen, Terje Skjærpe, Ronnie Willenheimer, Kristian Wachtell, Franz-Josef Neumann and Christa Gohlke-Bärwolf



1525 pts
SEAS study

Conclusions—Patients with low-gradient "severe" aortic stenosis and normal ejection fraction have an outcome similar to that in patients with moderate stenosis. (*Circulation*. 2011;123:887-895.)

Prevalence and Long-Term Outcome of Aortic Prosthesis–Patient Mismatch in Patients With Paradoxical Low-Flow Severe Aortic Stenosis



Conclusions—In this large catheterization-based study, the coexistence of PLF-AS before surgery and PPM after surgery is associated with the poorest outcome. (***Circulation*. 2014;130[suppl 1]:S25-S31.**)

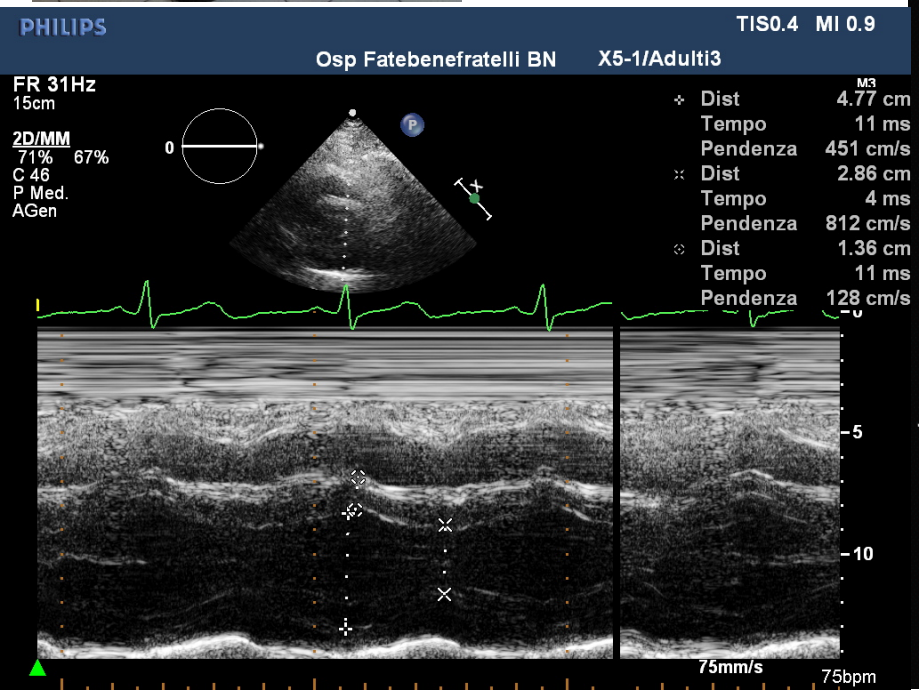
Mohty M *Circulation* 2014

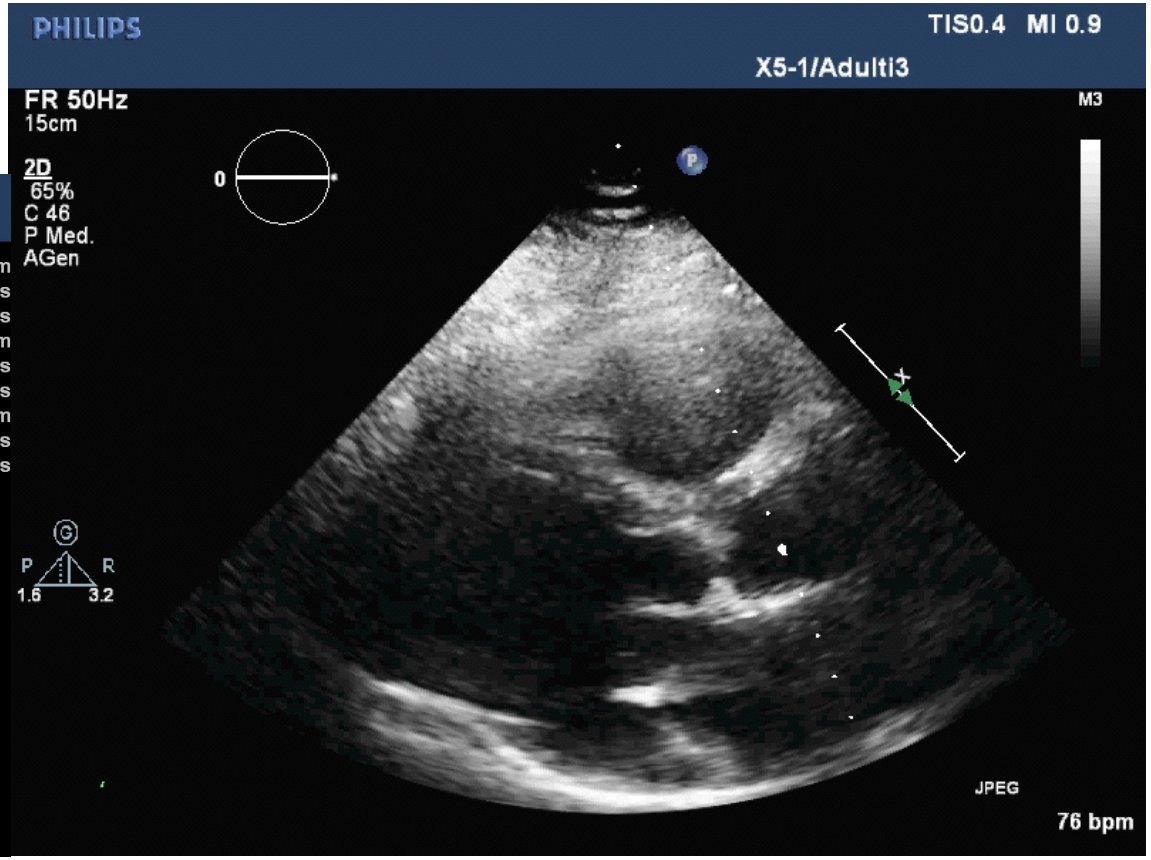
Paziente di 75

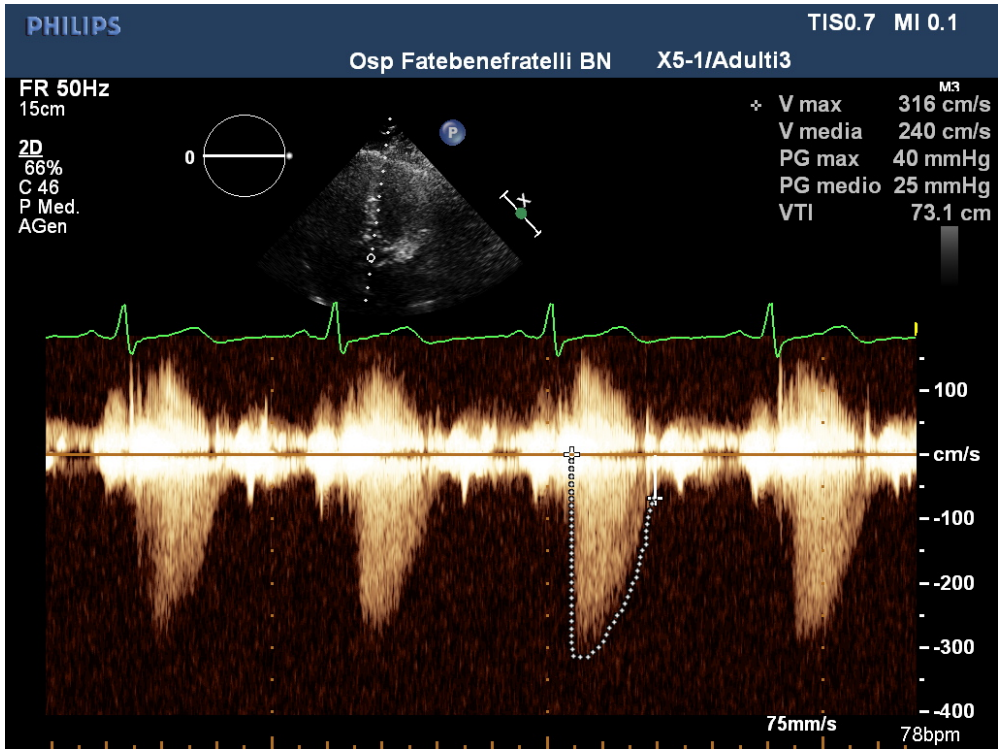
Ipertesa, dislipidemica, diabetica

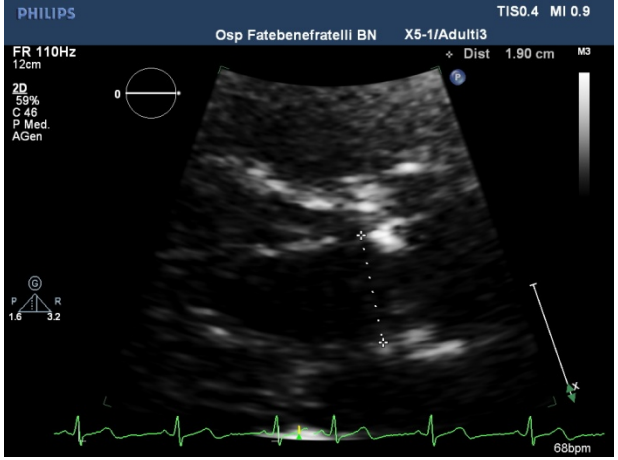
S.C. 2.01

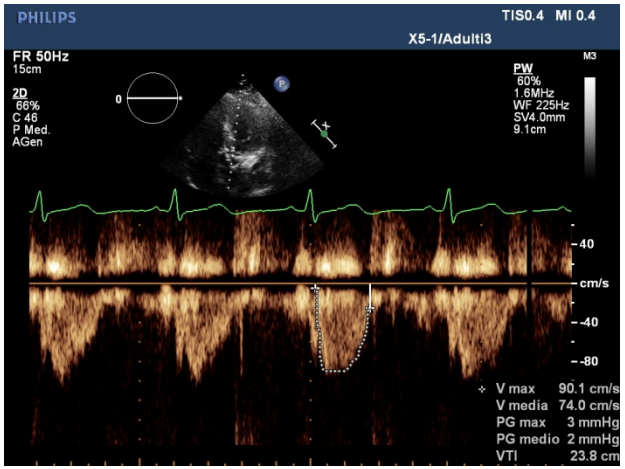
Soffio sistolico rude 4/6





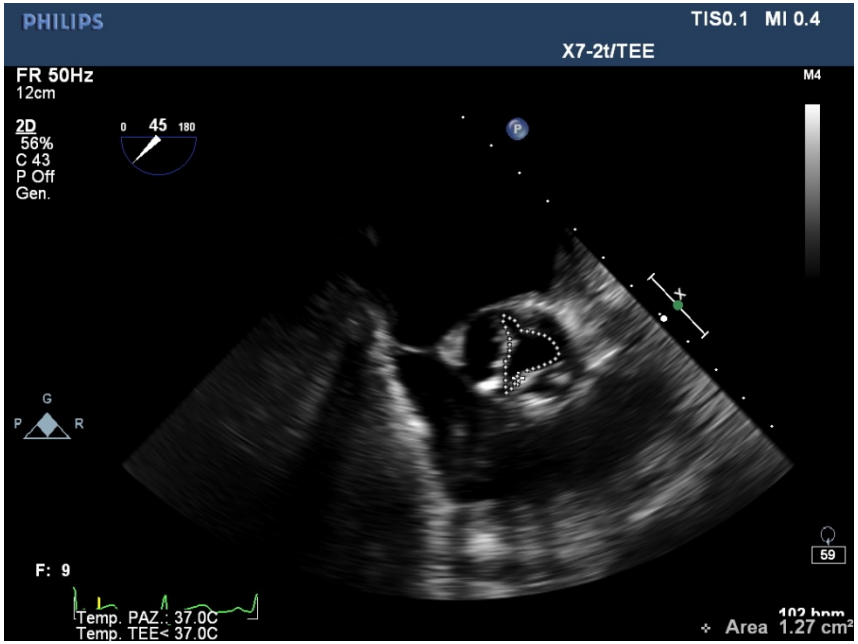






Gradiente medio 25 mmHg (***LFLG??***)

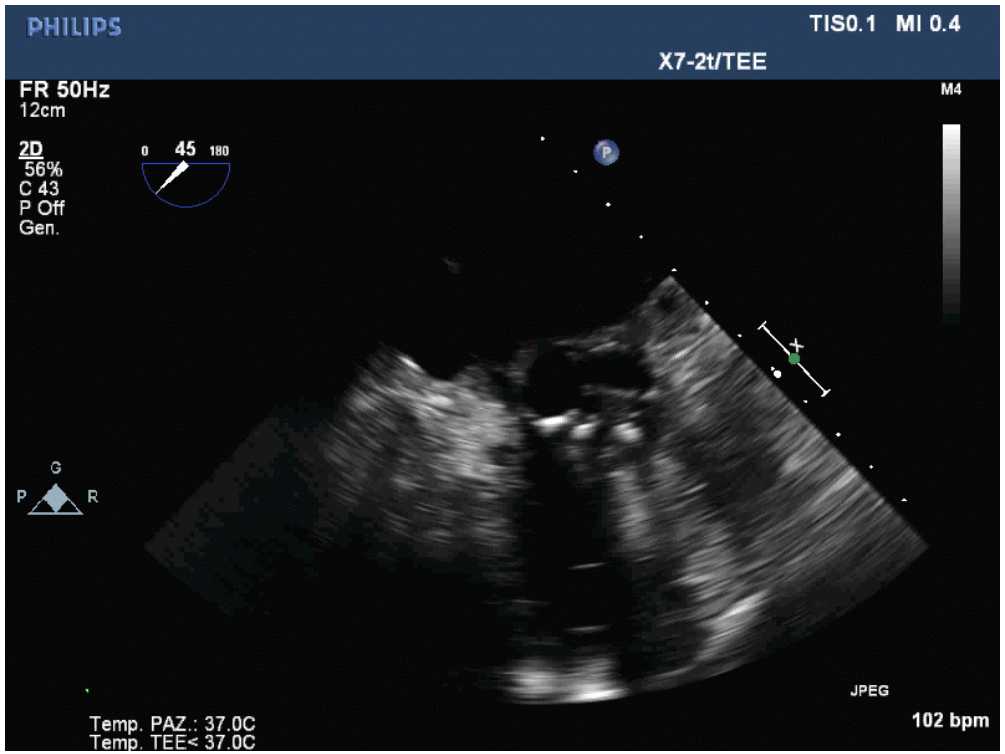
- Area valvolare con equazione di continuità: 0.98 cm^2, 0.49 cm^2/m^2
- Stroke volume index: 33 ml/m^2
- Z score: 5.3 $mmHg/ml/m^2$

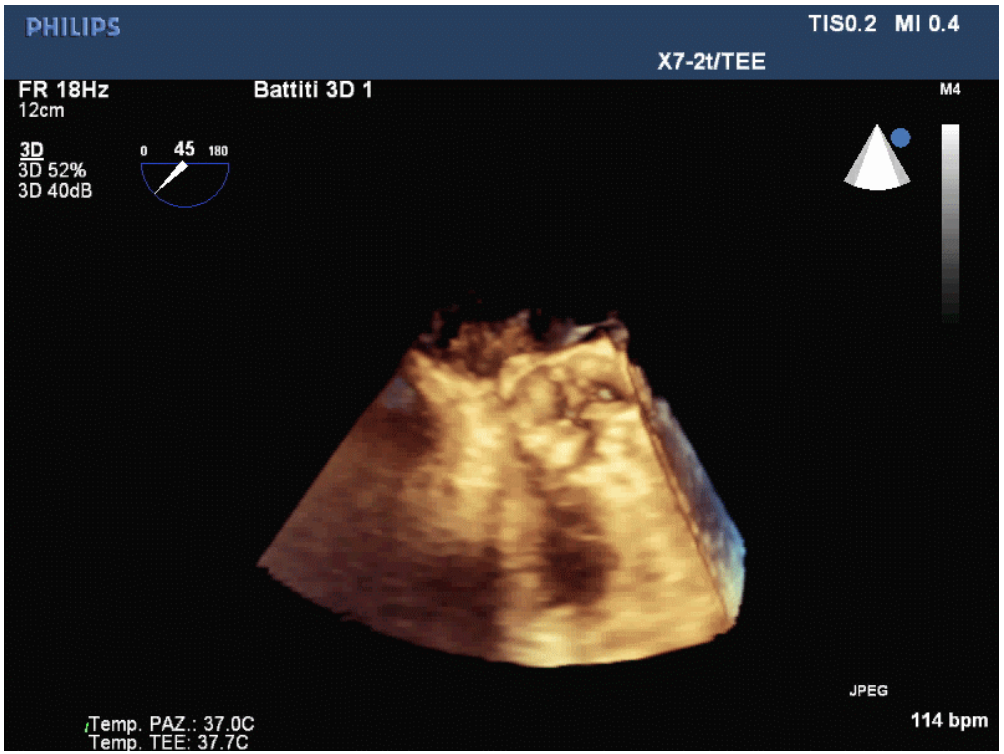


Stenosi aortica LFLG??

- Area valvolare planimetrica: 1.27 cm^2, 0.64 cm^2/m^2

➪ **Stenosi aortica moderata**





AVR should be considered in symptomatic patients with low flow, low gradient (< 40 mmHg) AS with normal EF only after careful confirmation of severe AS.	IIa	C

European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 -
doi:10.1093/ejcts/ezs455).

consisted of 128 patients (Figure 1). Severity of AS was confirmed in 119 (93%) patients by transoesophageal echocardiography and in 111 (87%) patients by surgical inspection during open-chest valve replacement. Patients were compared against a control group of 20 healthy

KEY POINTS

- Contrary to previous paradigms, a substantial proportion of patients with severe aortic stenosis have a low flow and low gradient despite a normal ejection fraction.
- This entity represents a more advanced form of the disease and is due to a restrictive physiology in relation with more severe LV concentric remodeling and a smaller LV cavity.
- Because of frequent pitfalls, diagnosis should include a comprehensive echocardiographic evaluation of LV function and morphology and in particular a validation of LV stroke volume measurements.
- The recent European Society of Cardiology/European Association for Cardio-Thoracic Surgery guidelines acknowledge the existence of this entity, emphasize the importance of validating measurements and recommend (class IIa) valve replacement in symptomatic patients.

Dumesnil JG *Cur Opin Cardiol* 2013

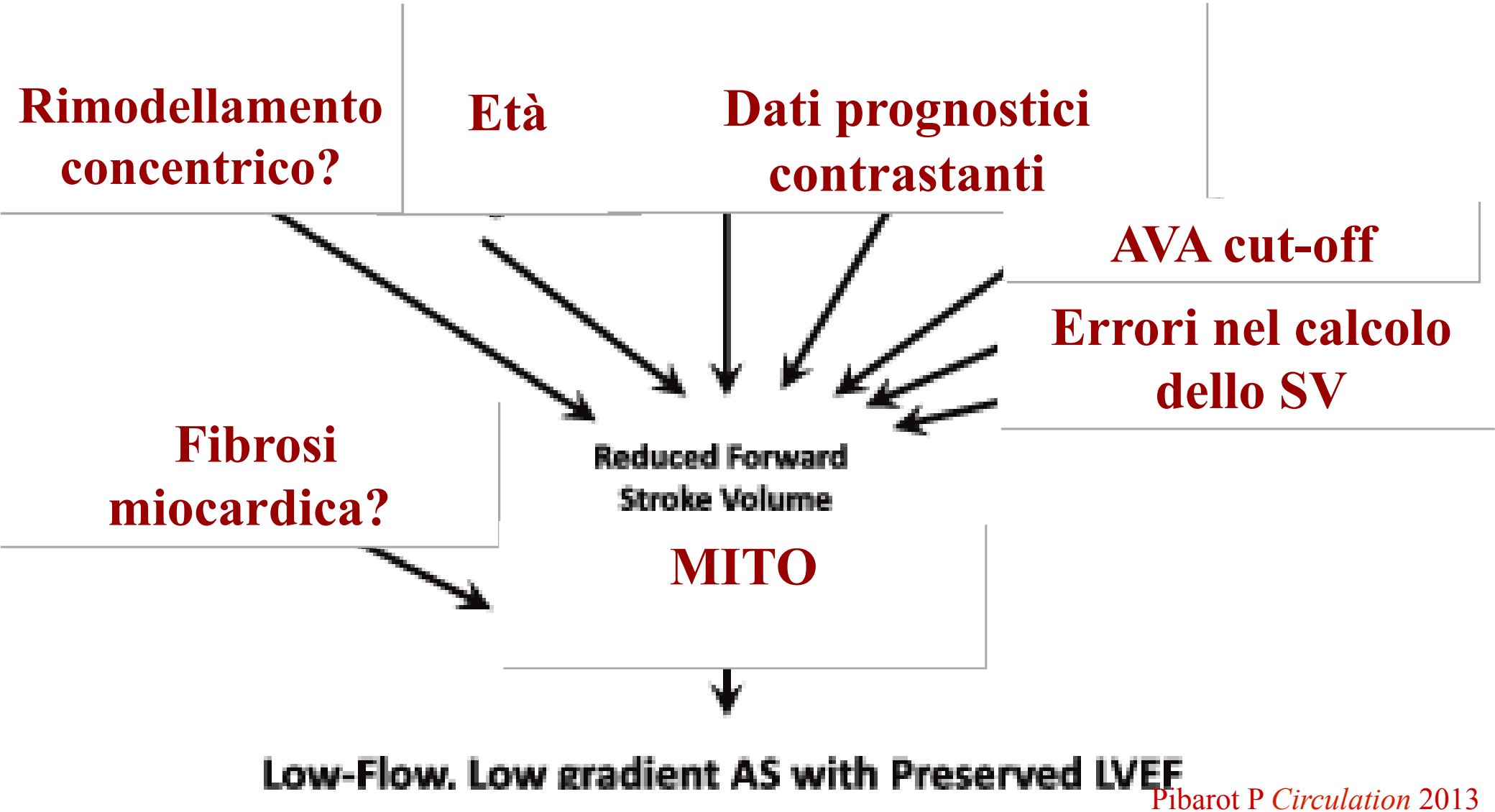
Circulation

Aortic Stenosis : Two Steps Forward, One Step Back

Blase A. Carabello

Circulation. 2007;115:2799-2800

LF LG Stenosi aortica
Mito



Pibarot P *Circulation* 2013

Il mito come racconto della realtà [modifica wikitesto]

I miti, come le parabole, e le fiabe hanno dunque il compito di far arrivare l'ascoltatore al mondo dei principi attraverso la parola e il coinvolgimento emotivo. Spetterà poi alla razionalità il chiarimento delle presunte contraddizioni e la disposizione degli avvenimenti nella giusta luce, senza tuttavia disconoscere l'essenza del mito.