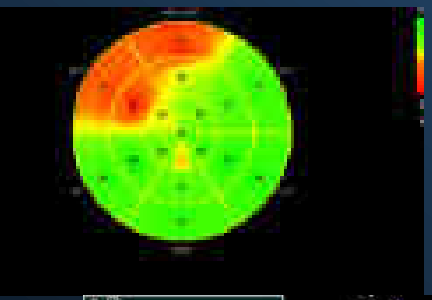
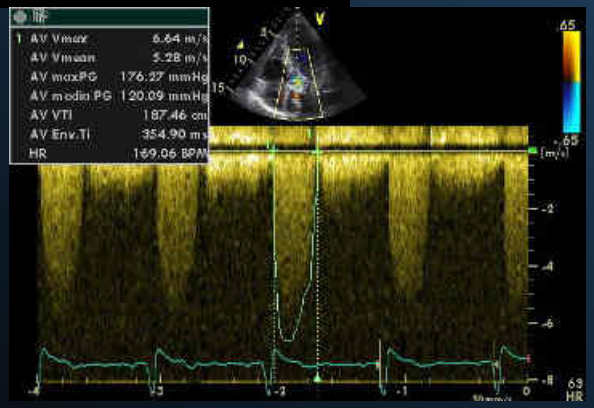
ASL Salerno
Azienda Sanitaria Locale Salerno

Campus Cuore – 1.10.21

TRATTAMENTO DELL'IPERTENSIONE ARTERIOSA ASSOCIATA A STENOSI VALVOLARE AORTICA

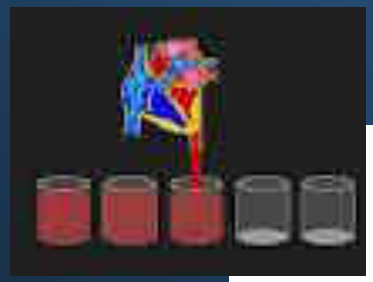


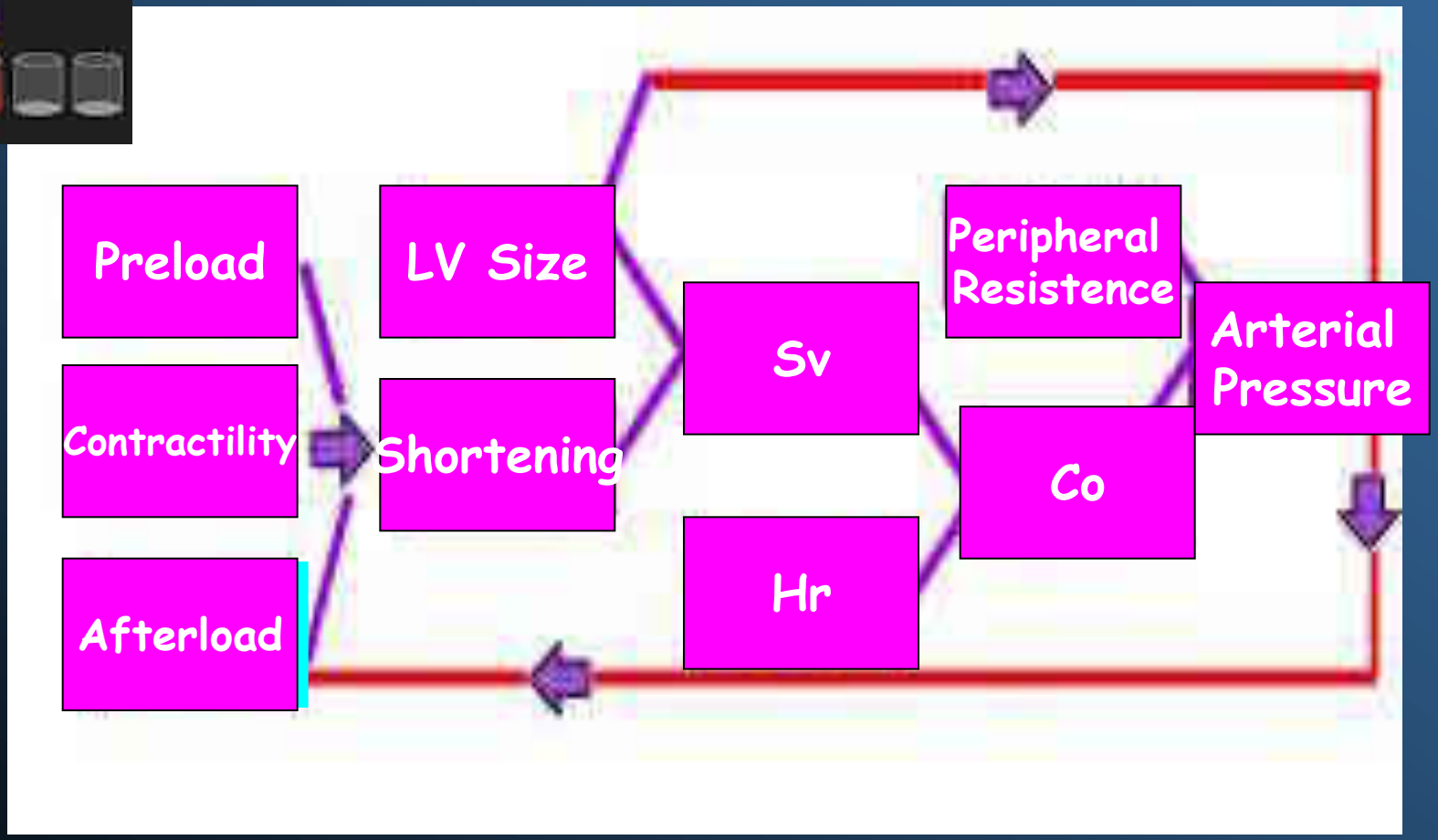


ANTONELLO D'ANDREA

UOC Cardiologia ed UTIC – PO Umberto I° Nocera Inferiore (ASL Salerno)

Determinants Of Cardiac Output



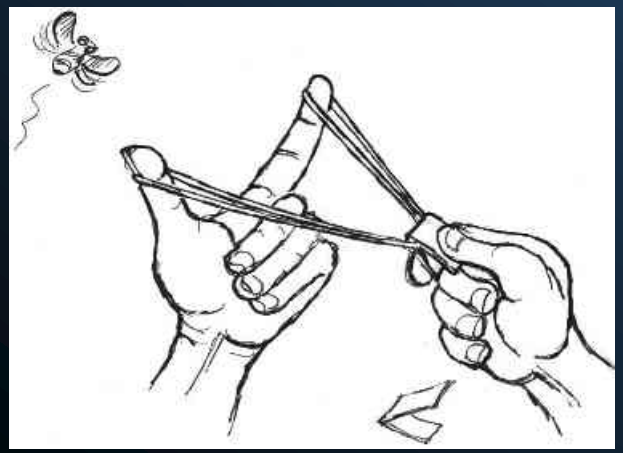


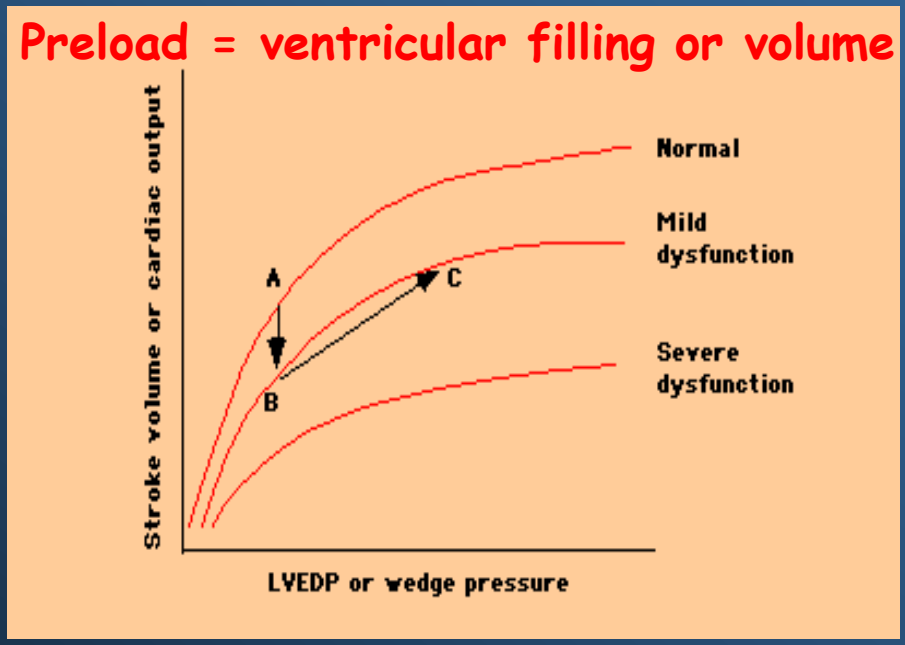
Determinants of Cardiac Output: PRELOAD

Amount of stretch of the ventricular myocardium prior to contraction

1. Central venous pressure (CVP) = right atrial pressure.

2. Pulmonary capillary diastolic wedge pressure (PCWP) = LVEDP



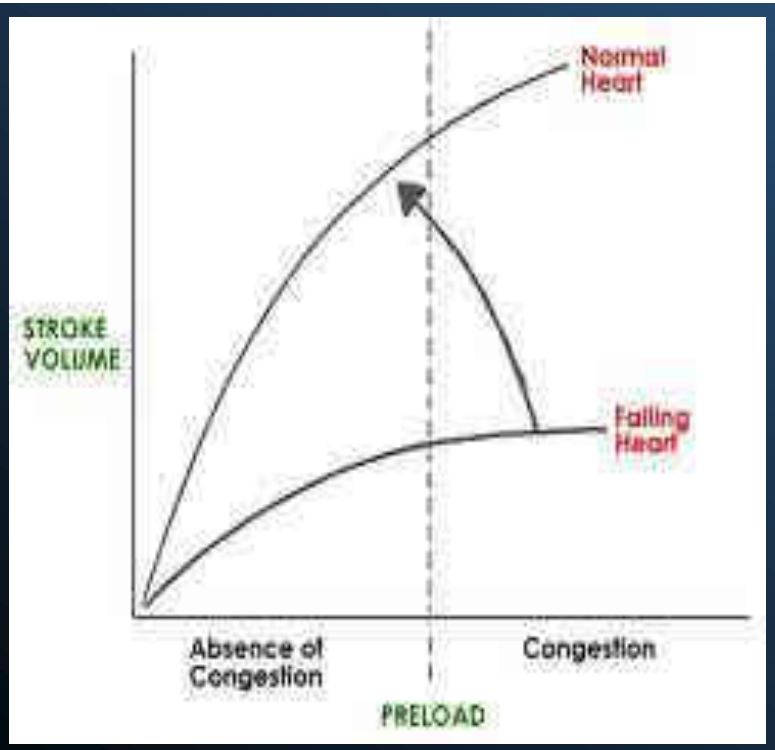


Frank-Starling Mechanism of the Heart

The intrinsic ability of the heart to adapt to changing volumes of inflowing blood

Frank-Starling Relationship
Long on Importance, Short on Mechanism

Richard L. Moss, Daniel P. Fitzsimons



- Normal range of the LVEDP, 5-6 mmHg
- Optimal initial preload, 15-20 mmHg (Sarcomere, 2.0 – 2.2 μm)
- When the LVEDP > 20 mmHg, LV work is maintained at almost the same level, does not change with the increase of LVEDP

AFTERLOAD

The load that a ventricle must overcome while it contracts during ejection

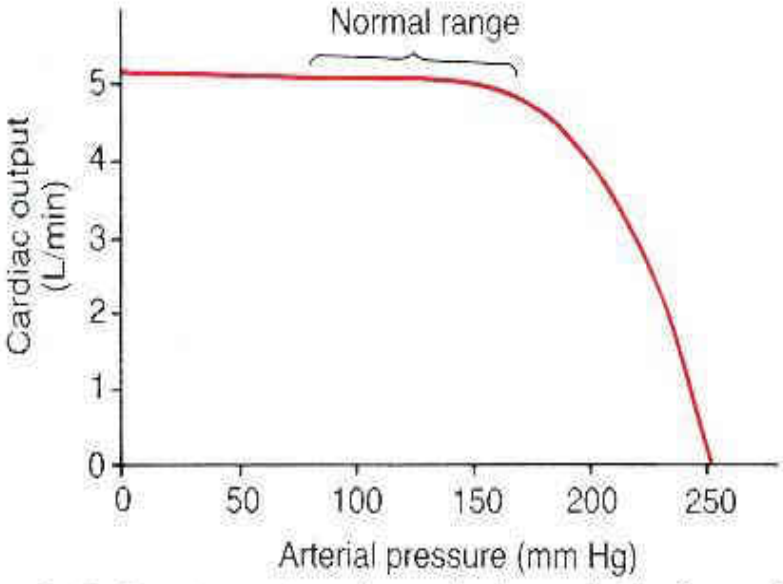
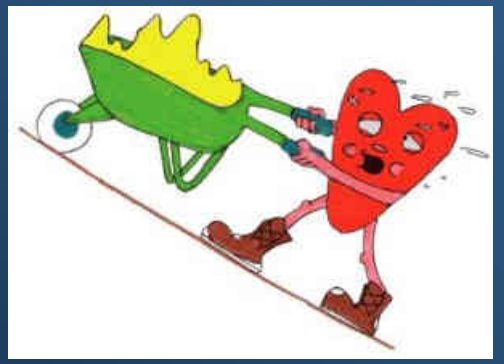
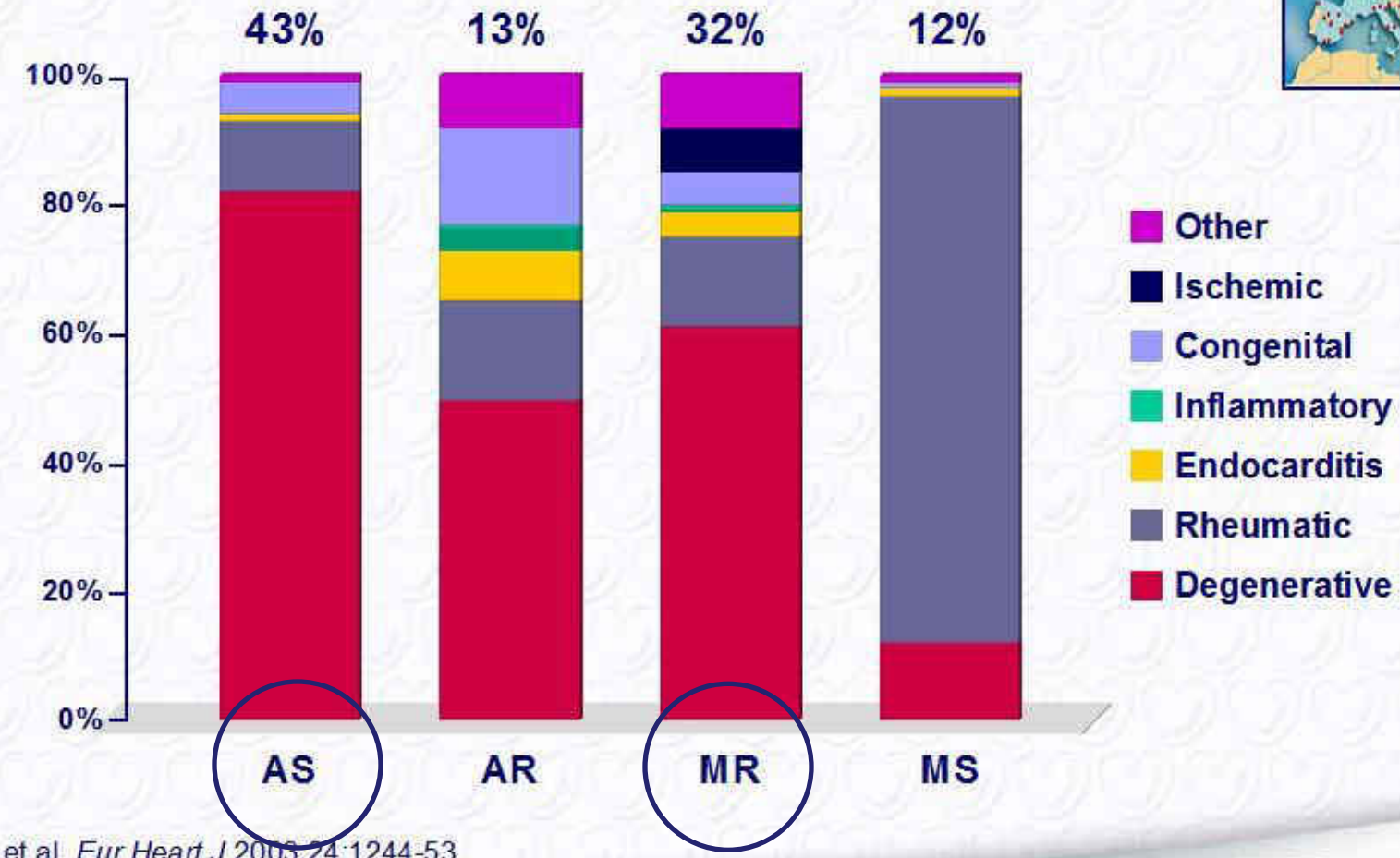


Figure 9–8. Constancy of cardiac output even in the face of wide changes in arterial pressure. Only when the arterial pressure rises above the normal operating pressure range does the pressure load cause the heart to begin to fail.



Aetiologies of Single Valvular Heart Diseases in the Euro Heart Survey



Iung et al. *Eur Heart J* 2003;24:1244-53

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

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EACTS

EUROPEAN SOCIETY OF CARDIOLOGY®

STAO: un Cardiopatico "Complesso" !!

Età Avanzata

Diabete Mellito

Ipertensione Arteriosa

Obesità

BPCO

Insuff. Renale Cronica

Frailty concept. Two 78-year-old patients with severe degenerative aortic stenosis, presenting with comparable Logistic EuroScores (~12%). The patient on the left appears much more frail than that one on the right, in spite of the same chronologic age and same predicted surgical risk.

Ipertensione e Stenosi Aortica

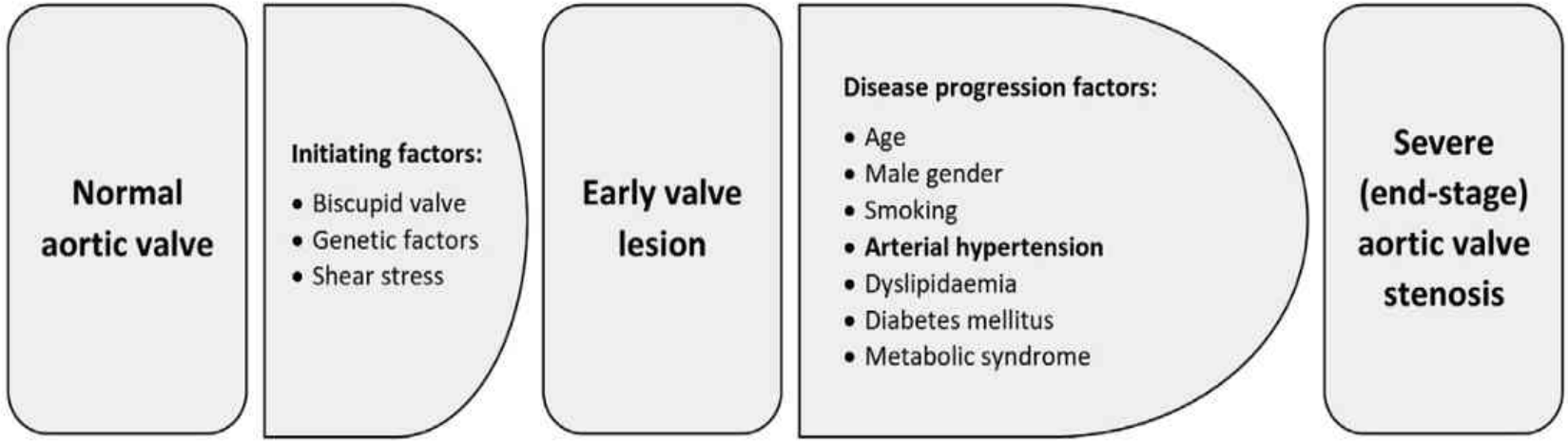
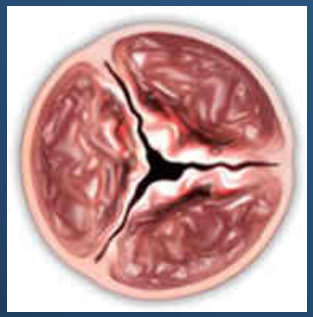


Figure 1 Factors involved in the initiation and progression of aortic valve sclerosis and stenosis.

Ipertensione e Stenosi Aortica

- Prevalenza
- Effetti sulla progressione
- Effetti sulla prognosi
- Effetti sul recupero post-intervento
- Effetti sul calcolo della severità



STENOSI AORTICA SEVERA

Sintomi e segni

- Dolore toracico, sincope, vertigini, dispnea, scompenso cardiaco di nuova insorgenza
- Soffio sistolico, scomparsa del II tono (specifico ma non sensibile)

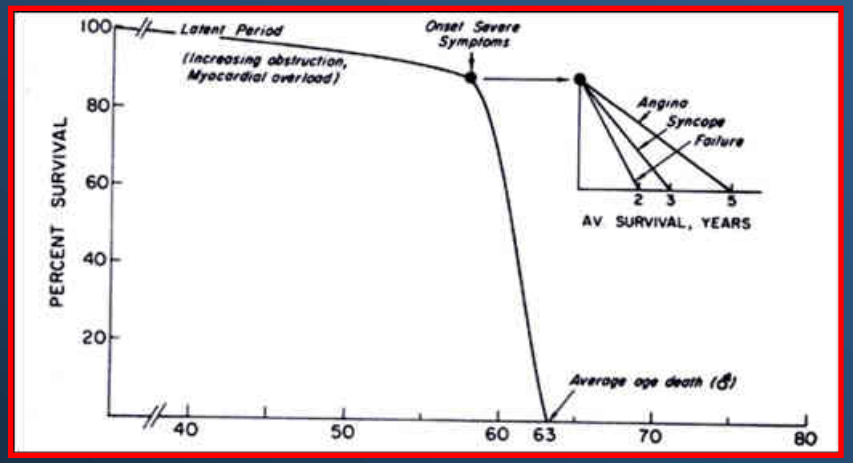
Dispnea
Angina
Vertigini
Sincope

Ostacolata eiezione di sangue dal vs (barrage aortico)
Aumento del post-carico
aumento della P ventricolare (sovraccarico di pressione)
ipertrofia concentrica (meccanismo di compenso)
alterazioni della fase diastolica (aumento della pressione telediastolica)
aumento delle pressioni di riempimento da parte dell'atrio sinistro
aumento del tempo di eiezione dal vs + diminuzione della pressione in aorta

riduzione della perfusione coronarica — aumento del consumo di ossigeno

ischemia miocardica

scompenso ventricolare sinistro (dilatazione VS + insufficienza mitralica)



Astenia
Affaticabilità
Ridotta tolleranza all'esercizio

} Ipoperfusione muscolare

Confusione
Difficoltà di concentrazione
Cefalea
Insonnia
Ansia

} Ipoperfusione cerebrale


pulsus alternans
forte
debole
forte
debole
forte
disfunzione severa LV
sovraccarico pericardico massivo
pulsus bisferiens
bifido
spike & dome
HOC
(polso dorato)
CO
SVR
pulsus parvus et tardus
normale
parvus
tardus
stenosi aortica
pulsus paradoxus
inspirazione ↑ ↓ SBP
tamponamento
costrizione pericardica
(COPD, broncospasmo, dispnea)

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Current Vascular Pharmacology, 2018, *16*, 000-000

REVIEW ARTICLE

Aortic Stenosis, Aortic Regurgitation and Arterial Hypertension

Katsi V[1,*], Georgiopoulos G[1,*], Oikonomou D[2], Aggeli C[1], Grassos C[3], Papadopoulos DP[4], Thomopoulos C[5], Marketou M[6], Dimitriadis K[1], Toutouzas K[1], Nihoyannopoulos P[1], Tsioufis C[1] and Tousoulis D[1]

Epidemiological data suggest a strong association between HT and AS .

Antonini-Canterin *et al*. reported that about 30% of patients with symptomatic AS were hypertensive.

In the PRO- GRESSA study, 37% of patients with AS had systolic HT Hueb *et al*. reported that 48% of patients with AS were classified as hypertensives, whereas among older patients with AS, HT is a common comorbidity found in up to 78% of patients.

PROGRESSION

- HT may contribute to AVC through induced mechanical stress on the valve causing endothelium injury, and through the well-known activation of the RAAS associated with elevated BP. In addition, HT has been reported as an independent risk factor for AVC and aortic sclerosis in population-based studies

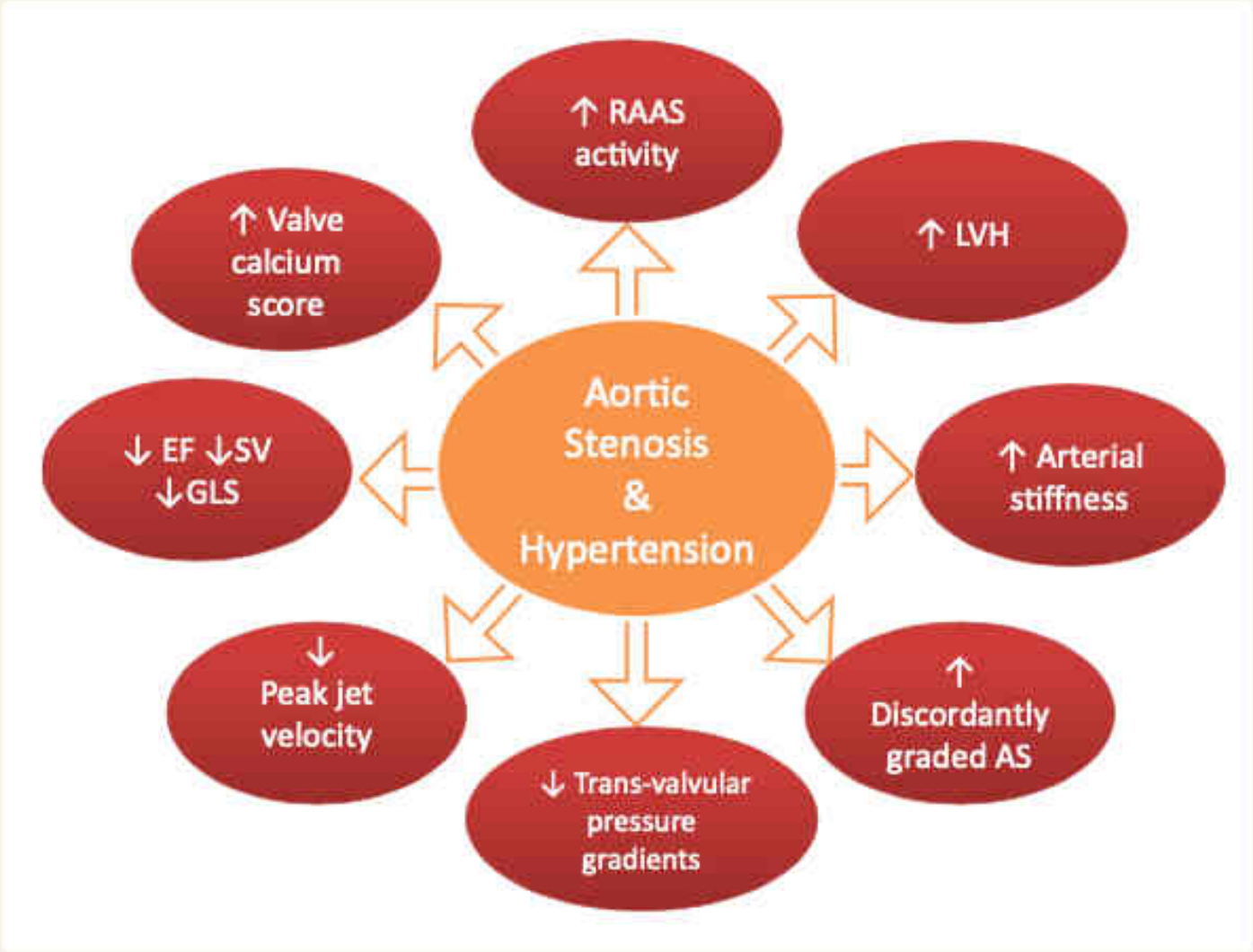


Figure 1 Main features of patients with combined arterial hypertension and aortic stenosis.

ABSOLUTE PROGNOSIS

- Hypertensive patients with asymptomatic AS had a 56% higher rate of ischaemic cardiovascular events and a 2-fold increased CV and total mortality according to a sub-analysis of the (Simvastatin and Ezetimibe in Aortic Stenosis) SEAS study.
- Moreover, in hypertensive patients with symptomatic AS, symptoms occur earlier and with larger valve area compared with normotensive subjects, probably due to the additional overload

PROGNOSIS AFTER AVR

HT influences adversely the prognosis of patients after AVR and is independently associated with CV death.

HT impairs LVM regression and reverses remodeling after AVR.

ESC
European Society of Cardiology
European Heart Journal (2021) **00**, 1–72
doi:10.1093/eurheartj/ehab395

2021 ESC/EACTS Guidelines for the management of valvular heart disease

Developed by the Task Force for the management of valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS)

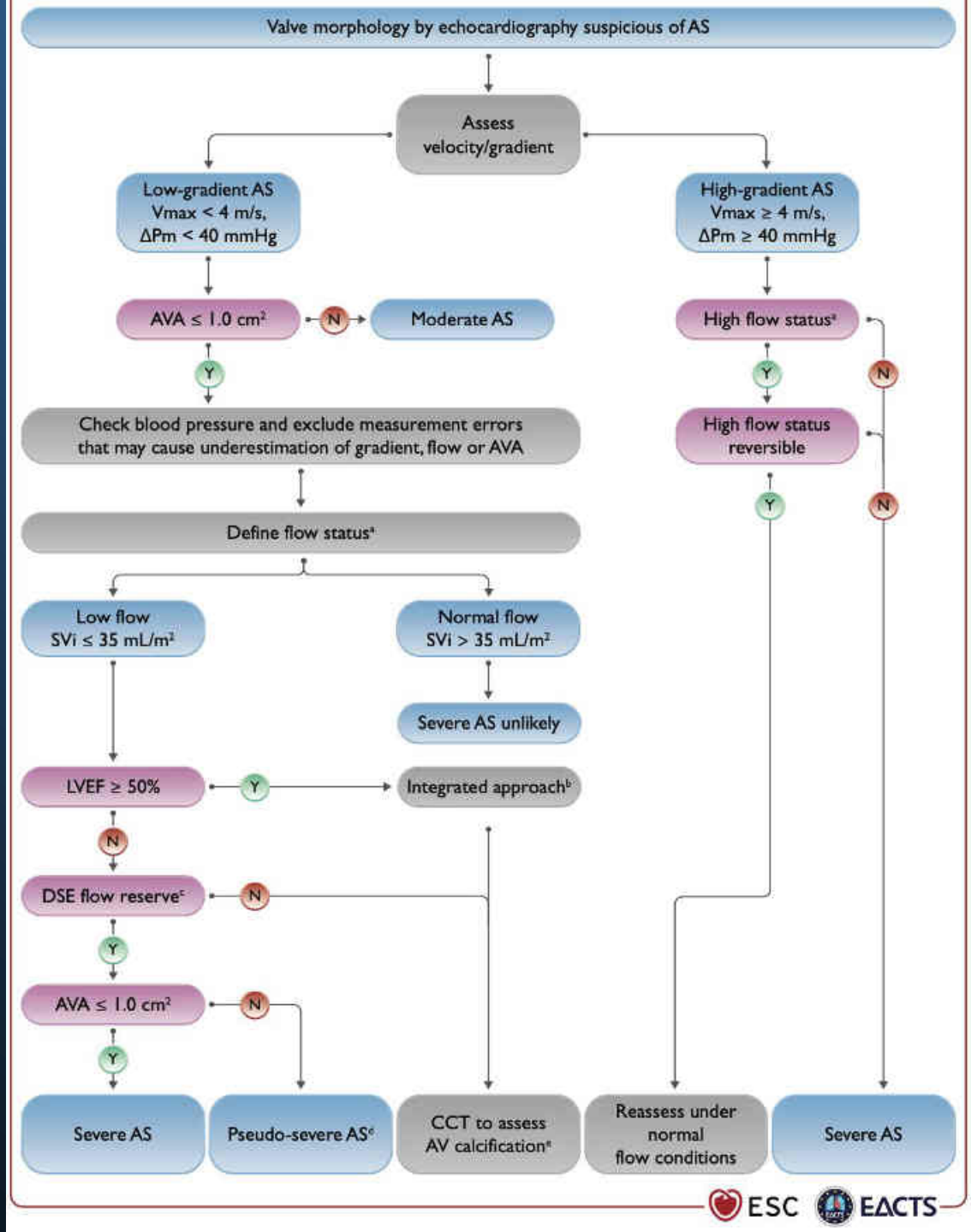
Authors/Task Force Members: Alec Vahanian * (ESC Chairperson) (France), Friedhelm Beyersdorf*[1] (EACTS Chairperson) (Germany), Fabien Praz (ESC Task Force Coordinator) (Switzerland), Milan Milojevic[1] (EACTS Task Force Coordinator) (Serbia), Stephan Baldus (Germany), Johann Bauersachs (Germany), Davide Capodanno (Italy), Lenard Conradi[1] (Germany), Michele De Bonis[1] (Italy), Ruggero De Paulis[1] (Italy), Victoria Delgado (Netherlands), Nick Freemantle[1] (United Kingdom), Martine Gilard (France), Kristina H. Haugaa (Norway), Anders Jeppsson[1] (Sweden), Peter Jüni (Canada), Luc Pierard (Belgium), Bernard D. Prendergast (United Kingdom), J. Rafael Sádaba[1] (Spain), Christophe Tribouilloy (France), Wojtek Wojakowski (Poland), ESC/EACTS Scientific Document Group

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

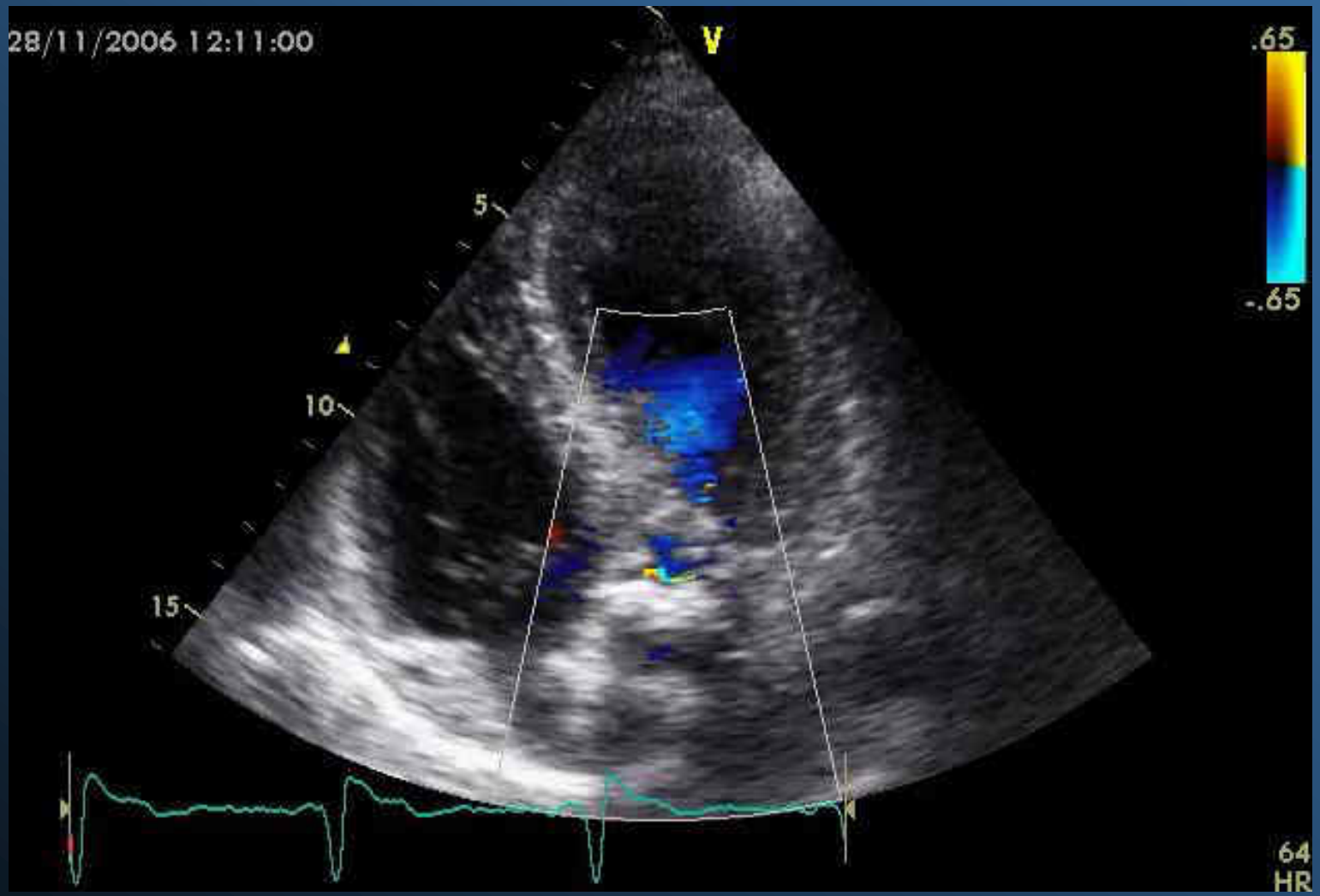
	Aortic stenosis	Mitral stenosis	Tricuspid stenosis
Valve area (cm^2)	< 1.0	< 1.0	–
Indexed valve area (cm^2/m^2 BSA)	< 0.6	–	–
Mean gradient (mmHg)	> 40	> 10	≥ 5
Maximum jet velocity (m/s)	> 4.0	–	–
Velocity ratio	< 0.25	–	–

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

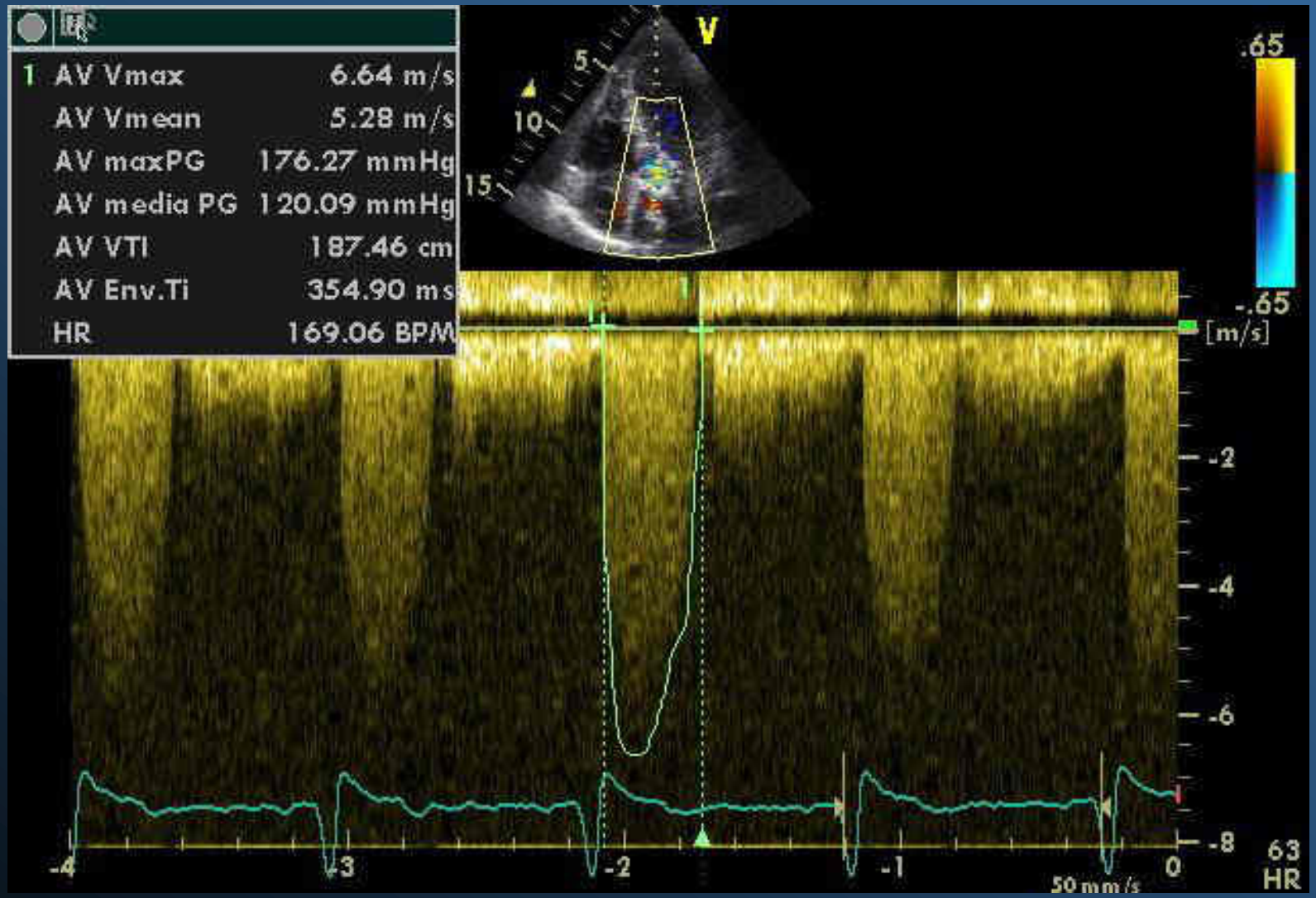
European Heart Journal 2012 - doi:10.1093/eurheartj/ehs109 &
European Journal of Cardio-Thoracic Surgery 2012 -
doi:10.1093/ejcts/ezs455).

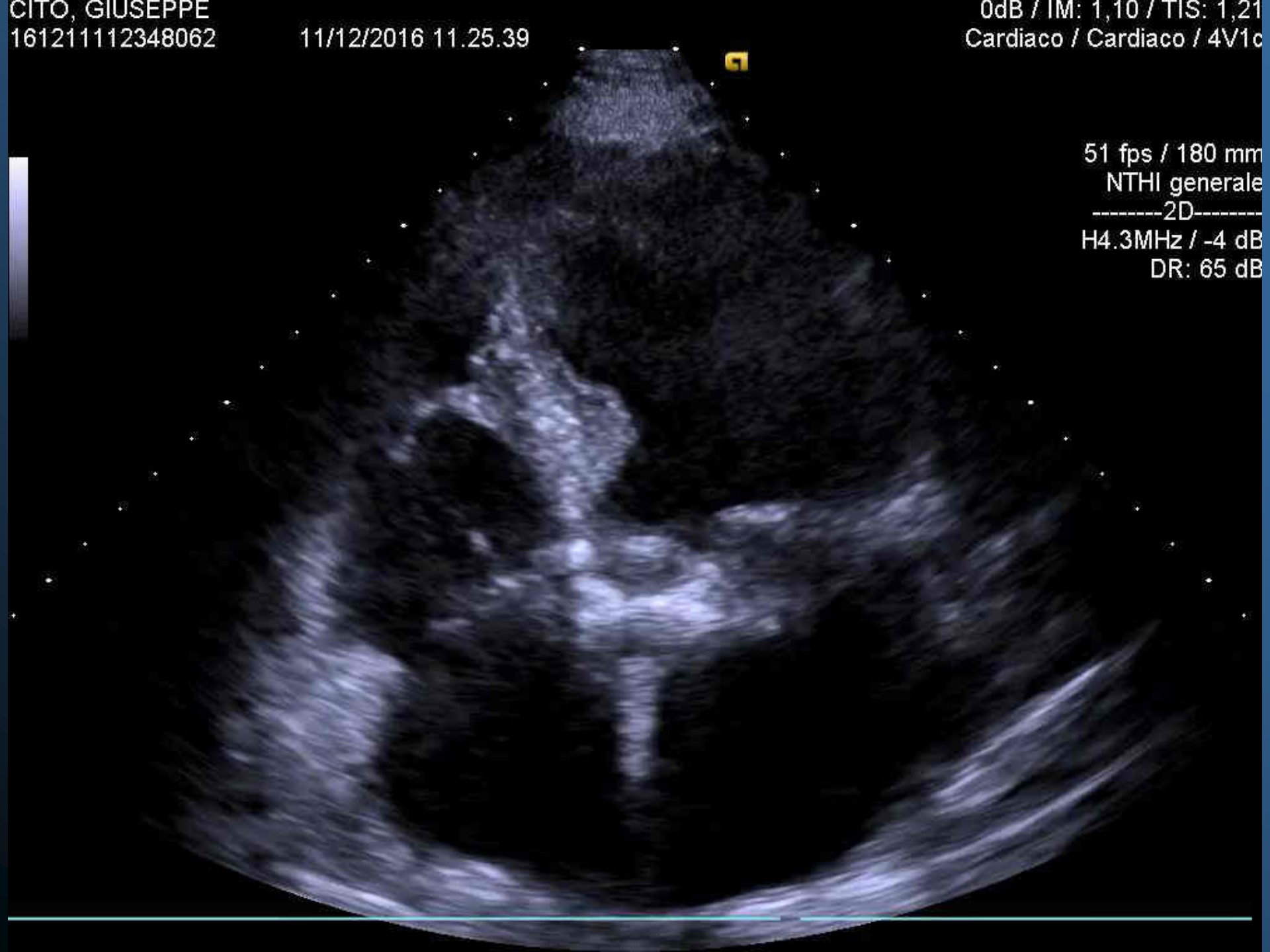

Valve morphology by echocardiography suspicious of AS
Assess velocity/gradient
Low-gradient AS Vmax < 4 m/s, ΔPm < 40 mmHg
High-gradient AS Vmax ≥ 4 m/s, ΔPm ≥ 40 mmHg
AVA ≤ 1.0 cm²
N
Moderate AS
Y
High flow status[a]
Y
N
Check blood pressure and exclude measurement errors that may cause underestimation of gradient, flow or AVA
High flow status reversible
Y
N
Define flow status[a]
Low flow SVi ≤ 35 mL/m²
Normal flow SVi > 35 mL/m²
Severe AS unlikely
LVEF ≥ 50%
Y
Integrated approach[b]
N
DSE flow reserve[c]
N
Y
AVA ≤ 1.0 cm²
N
Y
Severe AS
Pseudo-severe AS[c]
CCT to assess AV calcification[a]
Reassess under normal flow conditions
Severe AS

Severità della Stenosi



Stenosi Aortica Severa

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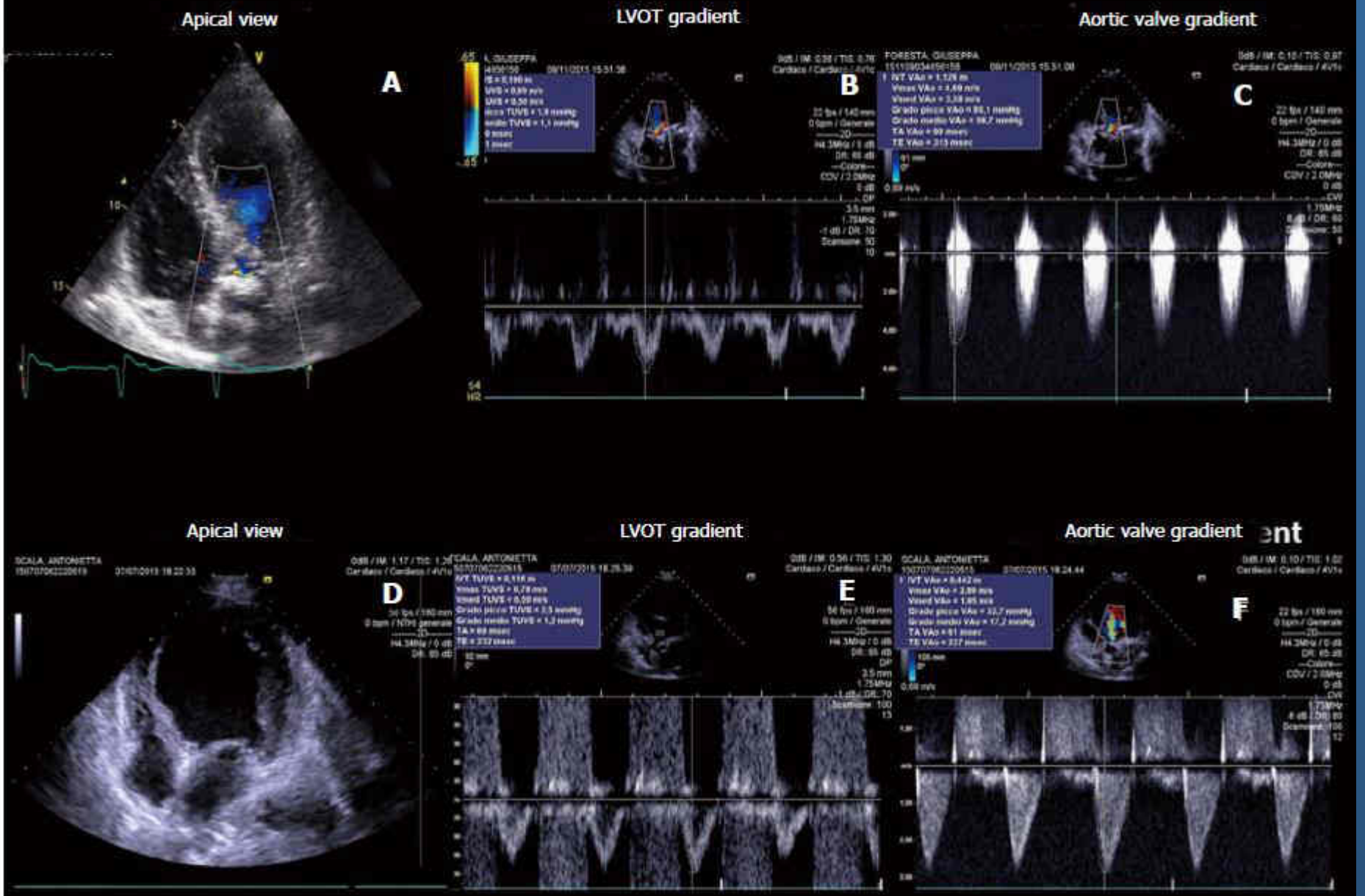
Apical view
LVOT gradient
Aortic valve gradient
A
B
C
Apical view
LVOT gradient
Aortic valve gradient
D
E
F

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STATE-OF-THE-ART PAPERS

Low-Flow, Low-Gradient Aortic Stenosis With Normal and Depressed Left Ventricular Ejection Fraction

Philippe Pibarot, DVM, PHD, Jean G. Dumesnil, MD
Québec City, Québec, Canada

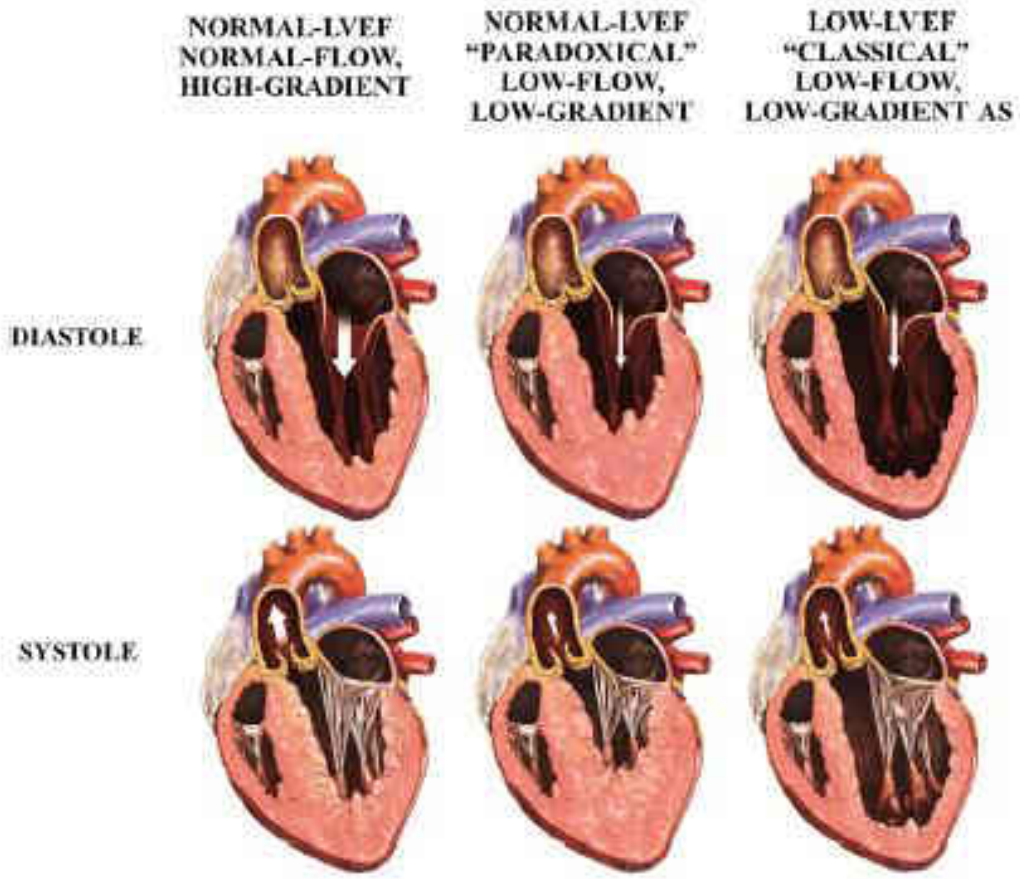


Figure 1 Different Patterns of Severe AS According to Flow, Gradient, and LV Geometry

Criteria that increase the likelihood of severe AS in pts. with AVA <1.0 cm^2, mean gradient < 40 mmHg and preserved EF

(Baumgartner et al)

Criteria	
Clinical criteria	• Typical symptoms without other explanation. • Elderly patient (>70 years).
Qualitative imaging data	• LV hypertrophy (additional history of hypertension to be considered). • Reduced LV longitudinal function without other explanation.
Quantitative imaging data	• Mean gradient 30–40 mmHg.
	• AVA ≤0.8 cm^2.

Criteria that increase the likelihood of severe AS in pts. with AVA < 1.0 cm², mean gradient < 40 mmHg and preserved EF

(Baumgartner et al)

Criteria *(continued)*	
Quantitative imaging data *(continued)*	• Low flow (SVi <35 mL/m²) confirmed by techniques other than standard Doppler technique (LVOT measurement by 3D TOE or MSCT; CMR, invasive data).
	• Calcium score by MSCT: – Severe aortic stenosis very likely: men ≥3000; women ≥1600, – Severe aortic stenosis likely: men ≥2000; women ≥1200, – Severe aortic stenosis unlikely: men <1600; women<800.

REVIEW

WILEY Echocardiography

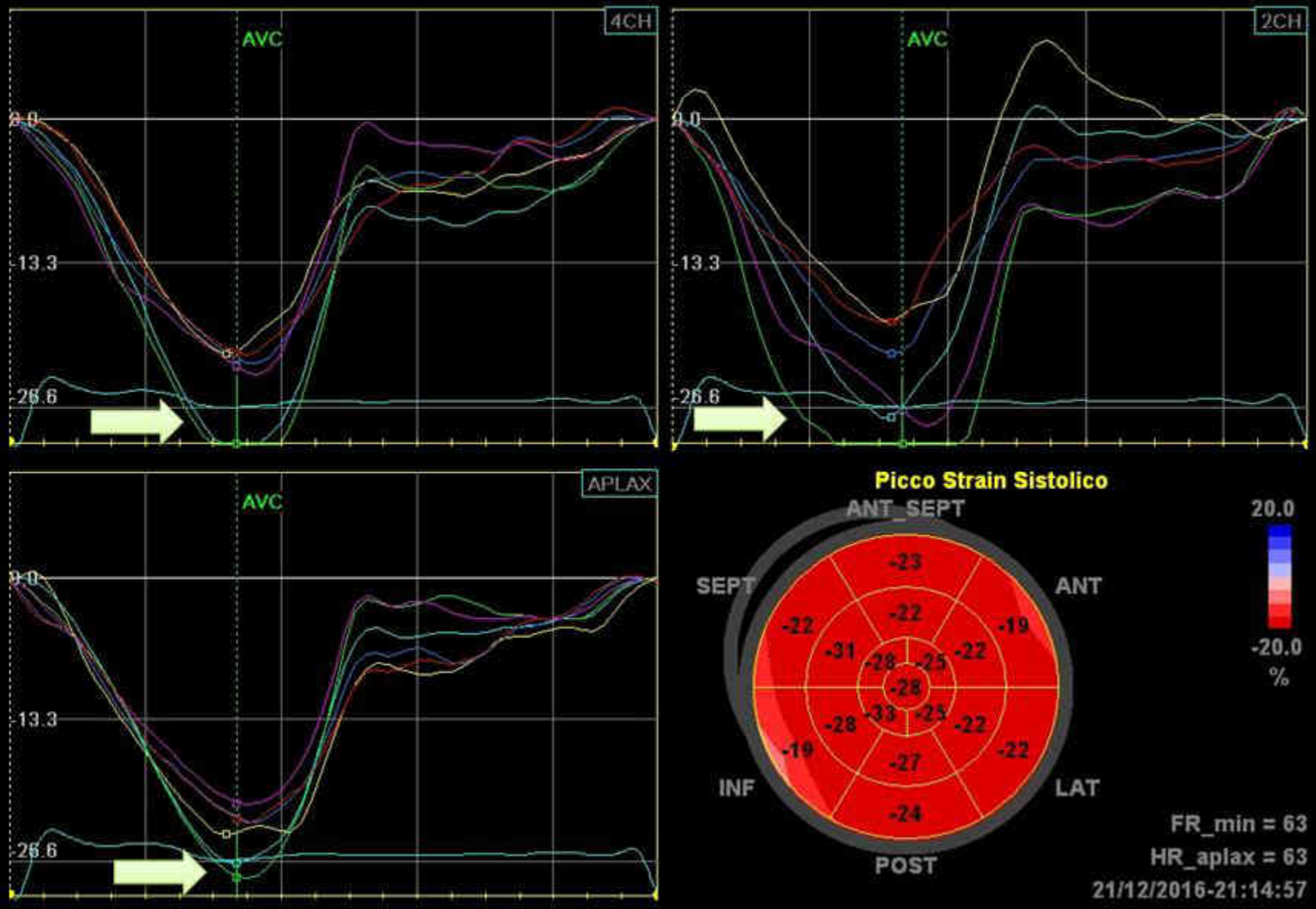
Left ventricular hypertrophy or storage disease? the incremental value of speckle tracking strain bull's eye

Antonello D'Andrea MD, PhD[1] | Juri Radmilovic MD[1] | Piercarlo Ballo MD[2] | Donato Mele MD[3] | Eustachio Agricola MD[4] | Matteo Cameli MD[2] | Andrea Rossi MD[5] | Roberta Esposito MD[6] | Giuseppina Novo MD[7] | Sergio Mondillo MD[2] | Roberta Montisci MD[8] | Sabina Gallina MD[9] | Eduardo Bossone MD[10] | Maurizio Galderisi MD[6] | On behalf of the Working Group on Echocardiography of the Italian Society of Cardiology

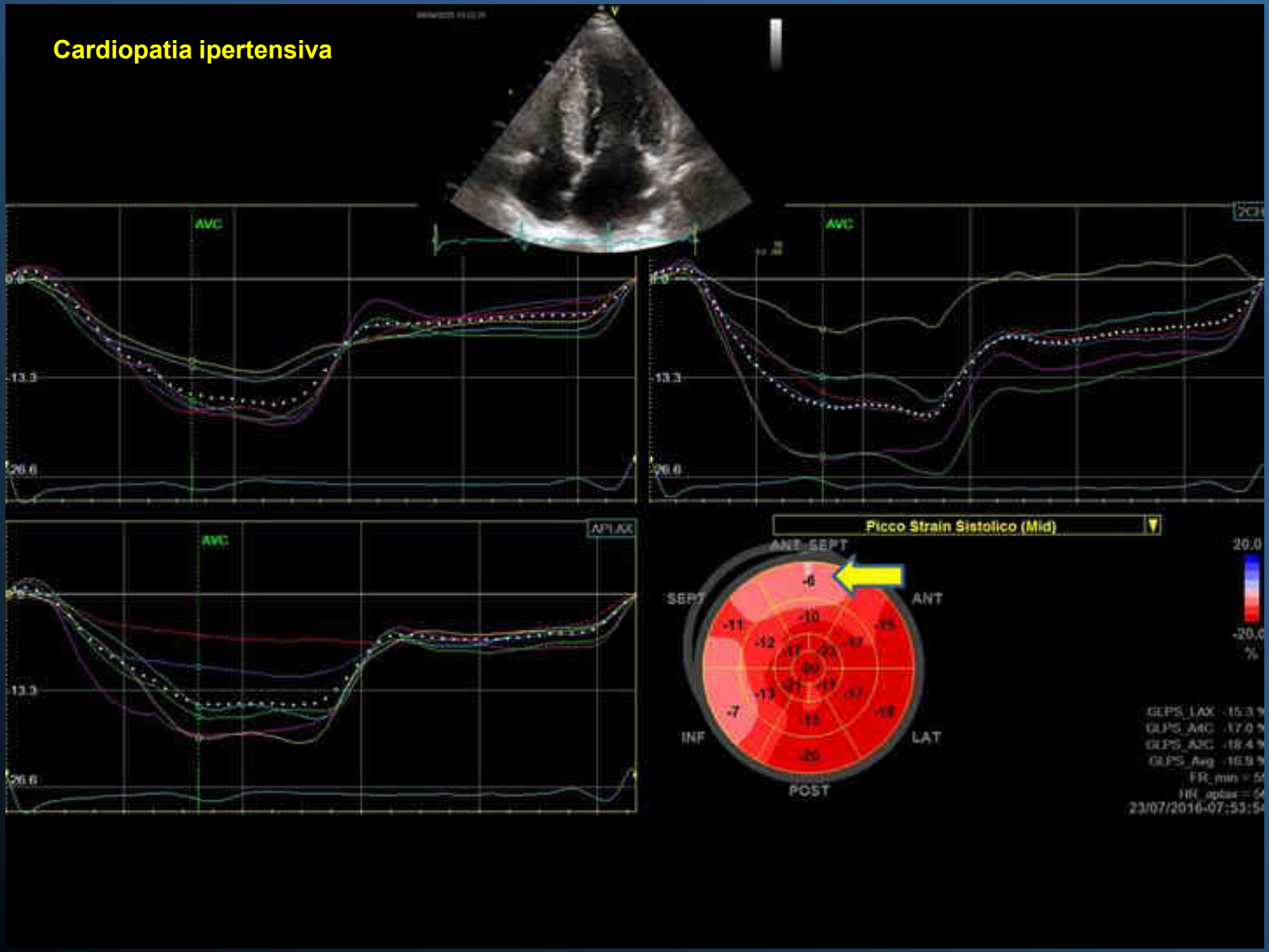
Type of left ventricular hypertrophy	Strain pattern	Mean GLS	Typical impairment on STE
Athlete's heart[14]	Normal GLS	−22.1±4.4%	None
Hypertrophic cardiomyopathy[20]	Reduced GLS	−15.7±3.6%	IVS
Arterial hypertension[22]	Reduced GLS—normal	−18.3±2.1%	IVS
Aortic stenosis[29]	Reduced GLS and GRS		Basal LV segments
Low flow-low gradient		−11.6±3.4%	
Normal flow-high gradient		−13.6±3.2%	
Normal flow-low gradient		−14.8±3.0%	
Aortic stenosis after TAVI[31]	GLS improvement	−16.3±4.2%	Basal LV segments
Mitral regurgitation[24]			
Initial disease	Normal/ supranormal GLS	−23.2±2.1%	None
Advanced disease	Reduced GLS	−17.2±3.0%	Basal segments and lateral wall
Aortic regurgitation[34]	Reduced GLS	−17.5 ±3.1%	Diffused
Cardiac amyloidosis[40]	Reduced GLS	−9.1±4.0%	Apical sparing
Fabry disease[42]	Reduced GLS		Basal posterior-lateral
Normal sphericity index		−18.3±3.1%	
Elevated sphericity index		−17.2±3.0%	
Anabolic steroid abuse[45]	Reduced GLS	−12.1±2.0%	Diffused

GLS, global longitudinal strain; GRS, global radial strain; IVS, interventricular septum; LV, left ventricular; STE, speckle tracking echocardiography; TAVI, transcatheter aortic valve implantation.

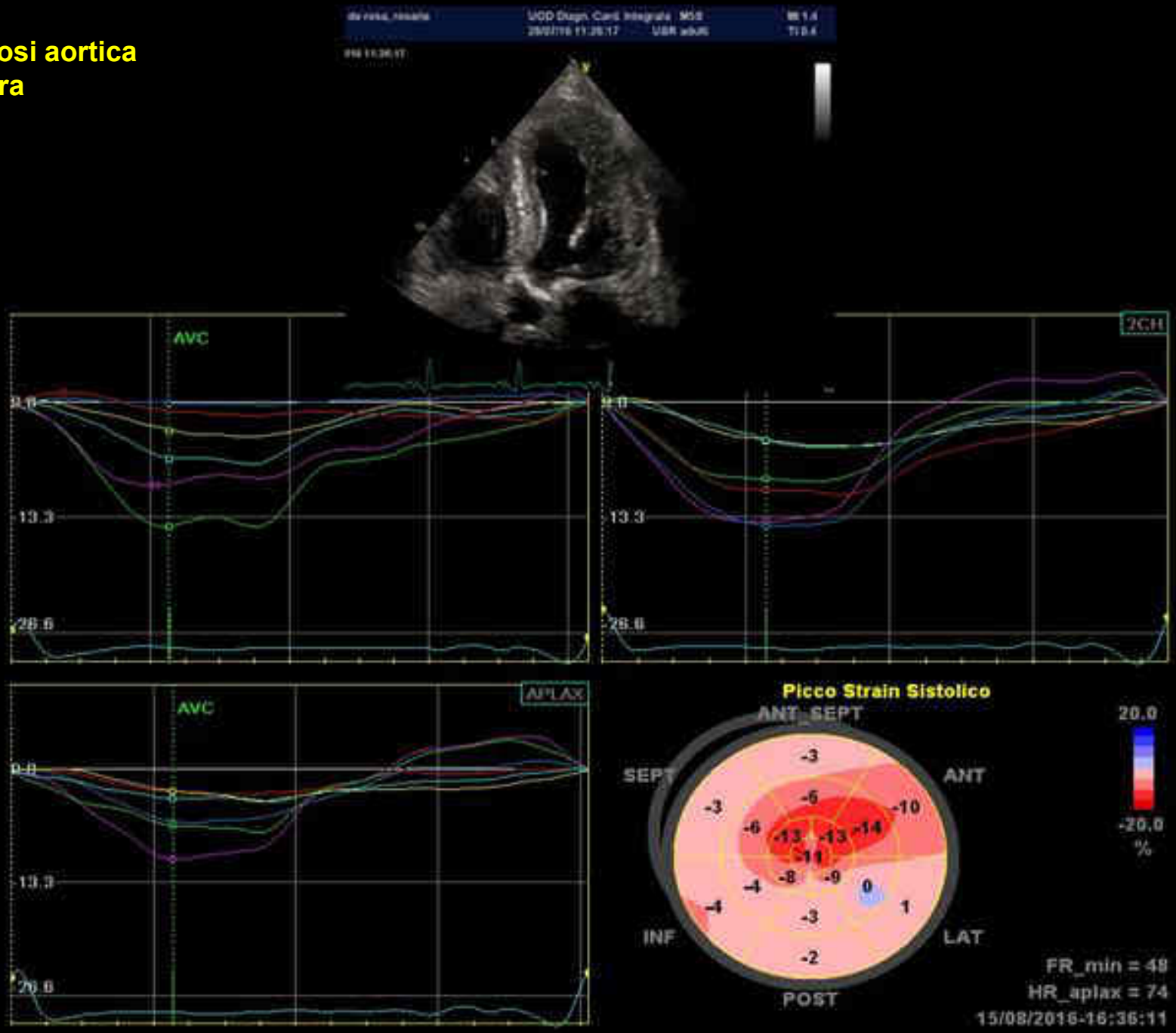
Soggetto Sano



Cardiopatia ipertensiva

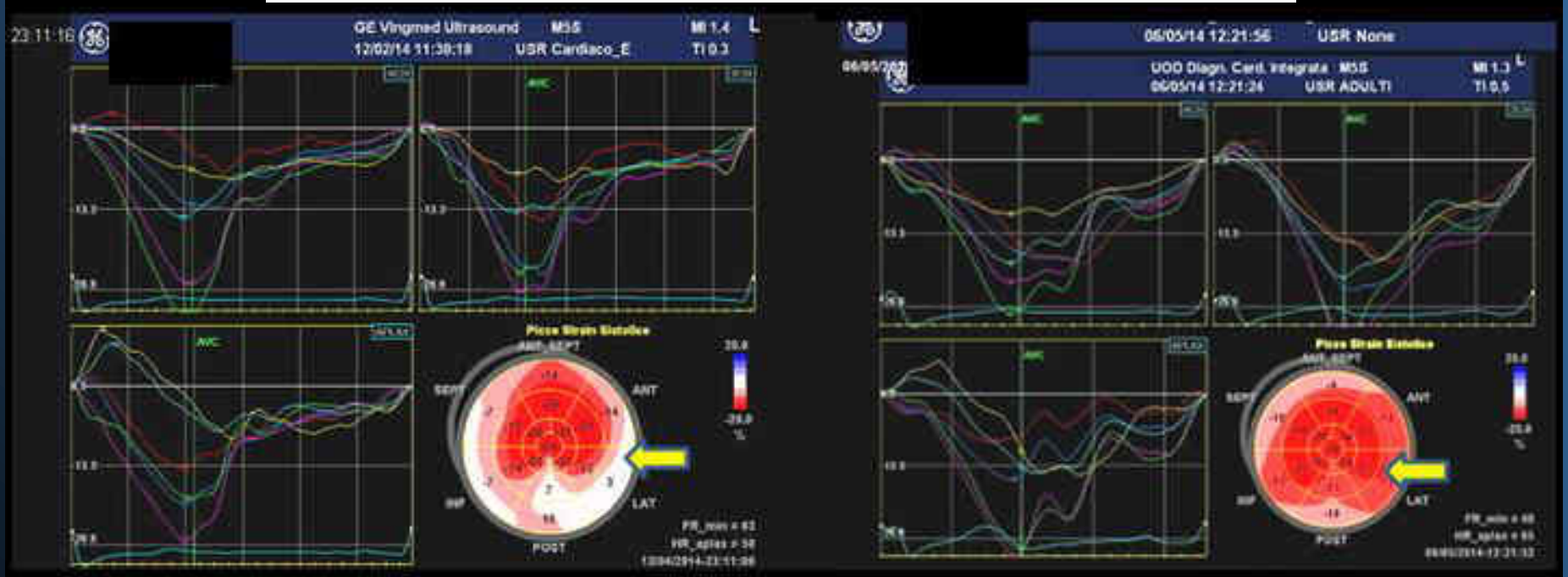


Stenosi aortica severa



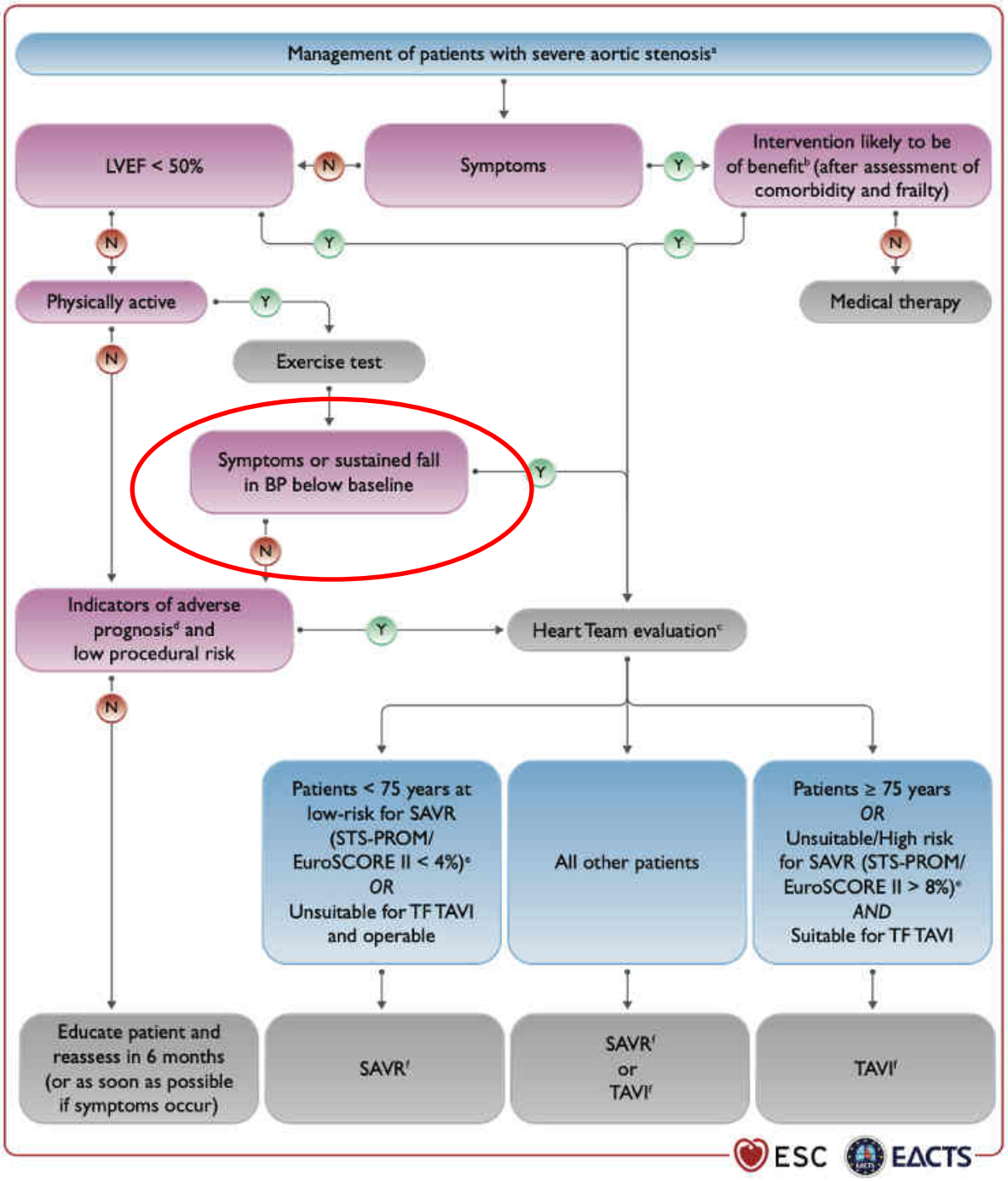
Effects of Transcatheter Aortic Valve Implantation on Left Ventricular and Left Atrial Morphology and Function

Antonello D'Andrea, M.D., F.E.S.C.,* Roberto Parodiro, M.D.,* Rosangela Cocchia, M.D.,* Enrico Di Palma, M.D.,* Lucia Riegler, M.D.,* Raffaella Gianfilia, M.D.,* Giovanni Rosa, M.D.,† Renato Bianchi, M.D.,* Donatella Tartaglione, M.D.,* Maurizio Cappelli Bigazzi, M.D.,* Paolo Calabrò, M.D.,* Rodolfo Citro, M.D.,‡ Eduardo Bossone, M.D., F.A.C.C.,‡ Raffaele Calabrò, M.D.,* and Maria Giovanna Russo, M.D.*



BASELINE

AFTER TAVI


Management of patients with severe aortic stenosis[a]
LVEF < 50%
N
Symptoms
Y
Intervention likely to be of benefit[b] (after assessment of comorbidity and frailty)
N
Y
Y
N
Physically active
Y
Medical therapy
N
Exercise test
Symptoms or sustained fall in BP below baseline
Y
N
Indicators of adverse prognosis[d] and low procedural risk
Y
Heart Team evaluation[c]
N
Patients < 75 years at low-risk for SAVR (STS-PROM/ EuroSCORE II < 4%)[e] OR Unsuitable for TF TAVI and operable
All other patients
Patients ≥ 75 years OR Unsuitable/High risk for SAVR (STS-PROM/ EuroSCORE II > 8%)[e] AND Suitable for TF TAVI
Educate patient and reassess in 6 months (or as soon as possible if symptoms occur)
SAVR[f]
SAVR[f] or TAVI[f]
TAVI[f]
ESC
EACTS

5.3 Medical therapy

No medical therapies influence the natural history of aortic stenosis. Statins (which demonstrated favourable effects in pre-clinical studies) do not affect disease progression[246] and clinical trials targeting calcium metabolic pathways are ongoing. Patients with heart failure who are unsuitable (or waiting) for SAVR or TAVI should be medically treated according to ESC heart failure Guidelines.[247] ACEI are safe in aortic stenosis (provided that BP is monitored carefully) and may have beneficial myocardial effects before the onset of symptoms, and after TAVI and SAVR.[248–250] Coexisting hypertension should be treated to avoid additional afterload, although medication (particularly vasodilators) should be titrated to avoid symptomatic hypotension.

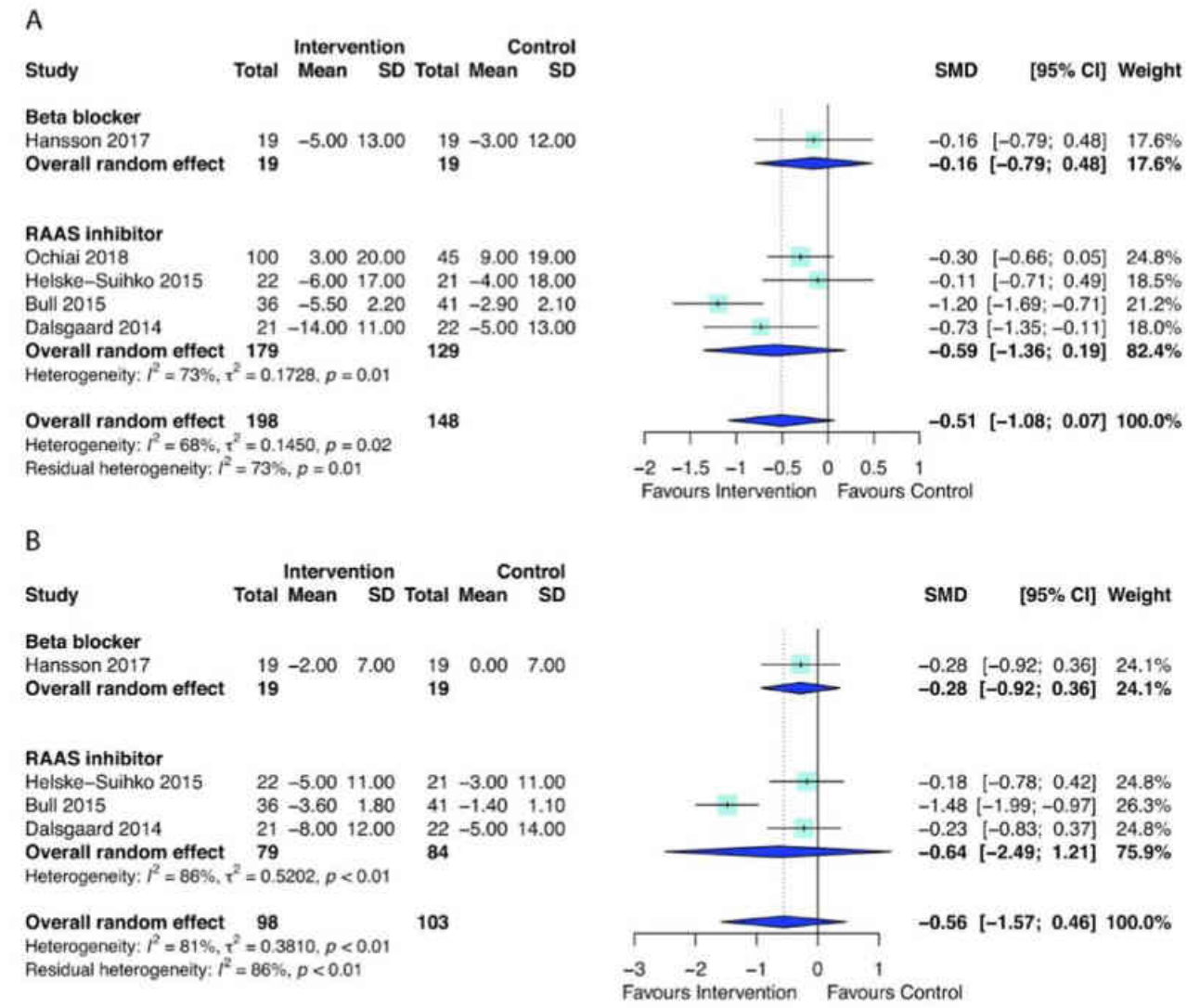
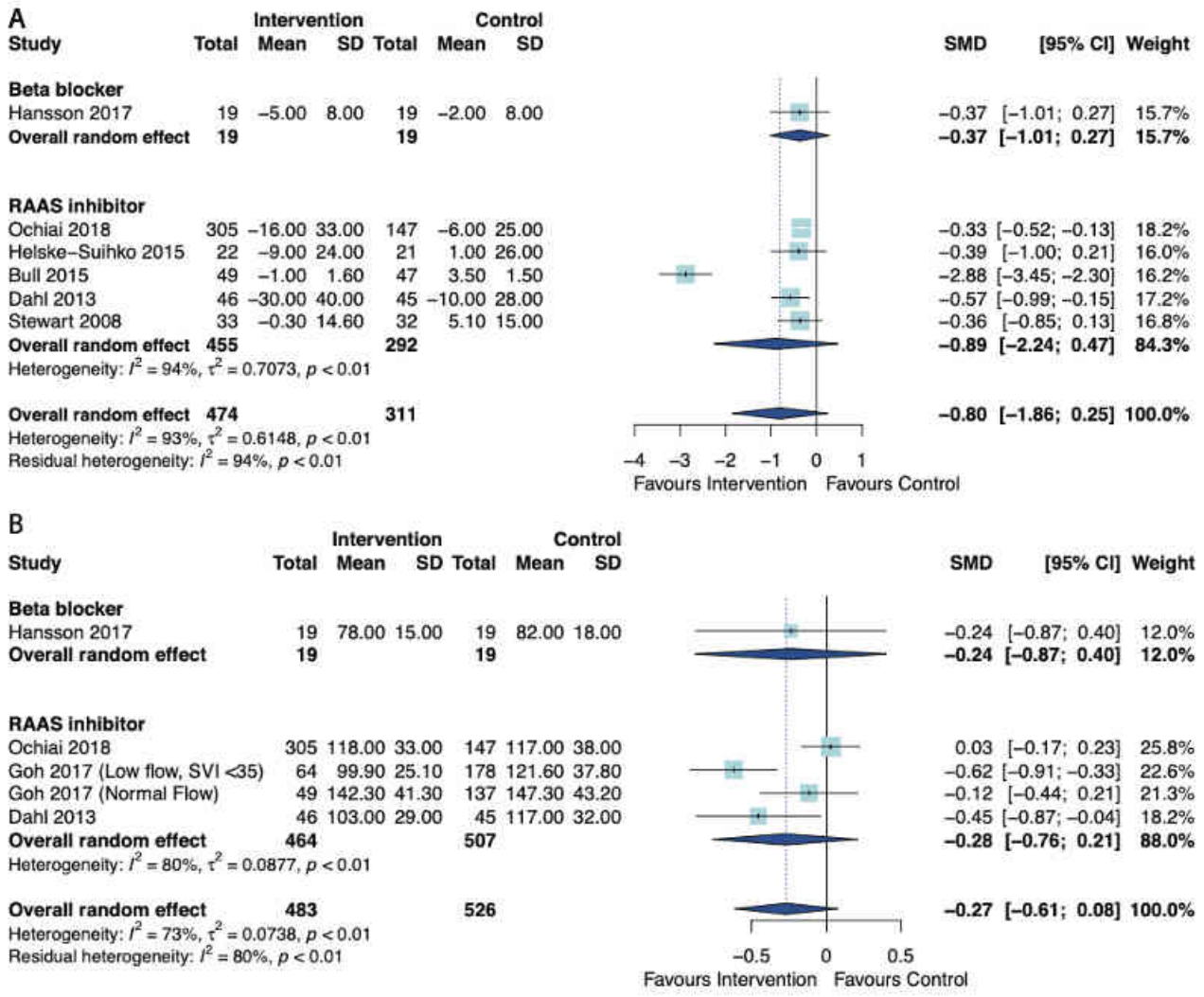


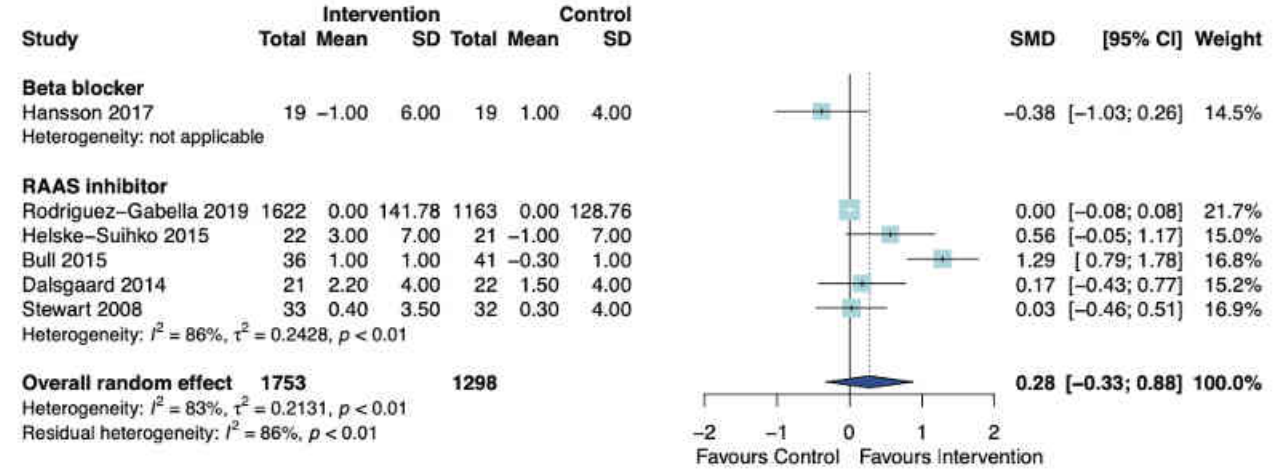
Figure 6 Forest plot of the effect of antihypertensive therapies on change in (A) systolic blood pressure and (B) diastolic blood pressure during follow-up. RAAS, renin-angiotensin and aldosterone systems; SMD, standardised mean difference.



LV Mass Pre

LV Mass Post

Figure 5 Forest plot of the effect of antihypertensive therapies on (A) change in Left Ventricular Mass Index (LVMI) and (B) post-LVMI. RAAS, renin–angiotensin and aldosterone systems; SMD, standardised mean difference.



LV Ejection Fraction

Figure 7 Forest plot of the effect of antihypertensive therapies on change in left ventricular ejection fraction during follow-up. RAAS, renin–angiotensin and aldosterone systems; SMD, standardised mean difference.

Table 4 Pooled risk ratios for postaortic valve replacement complications, haemodynamic and echocardiographic parameter changes with antihypertensive therapies at follow-up

Postoperative complications	No of studies	Risk ratio	95% CI	P value	I2 (%)
Postoperative atrial fibrillation	6	0.98	0.64 to 1.50	0.92	81.2
Postoperative stroke or transient ischaemic attack	4	0.45	0.06 to 3.69	0.31	86.9
Acute kidney injury	3	0.8	0.35 to 1.84	0.47	53
Permanent pacemaker	5	0.99	0.62 to 1.58	0.92	70
Readmission	5	0.79	0.40 to 1.60	0.43	82
Haemodynamic and echocardiographic parameters	**No of studies**	**SMD**	**95% CI**	**P value**	**I^2 (%)**
Post-mean arterial pressure	3	−0.62	−2.85 to 1.60	0.35	79
Change in heart rate	3	−0.41	−1.71 to 0.88	0.3	61
Post-heart rate	3	−0.68	−2.60 to 1.23	0.26	80
Change in aortic valve area	3	0.09	−0.36 to 0.54	0.48	37
Post-aortic valve area	3	0.01	−0.14 to 0.16	0.89	0
Post-mean pressure gradient	3	−0.16	−0.55 to 0.23	0.28	25
Post-deceleration time	3	0.03	−0.23 to 0.30	0.71	0
Post-E/A ratio	3	−0.06	−0.43 to 0.32	0.67	23
Post-E/e' ratio	4	0.16	−0.56 to 0.87	0.54	65

Other haemodynamic and echocardiographic changes.
SMD, standardised mean difference.;

BMJ Open

Antihypertensive therapies in moderate or severe aortic stenosis: a systematic review and meta-analysis

Jonathan Sen,[1,2] Erin Chung,[3] Christopher Neil,[1,2] Thomas Marwick [1,2]

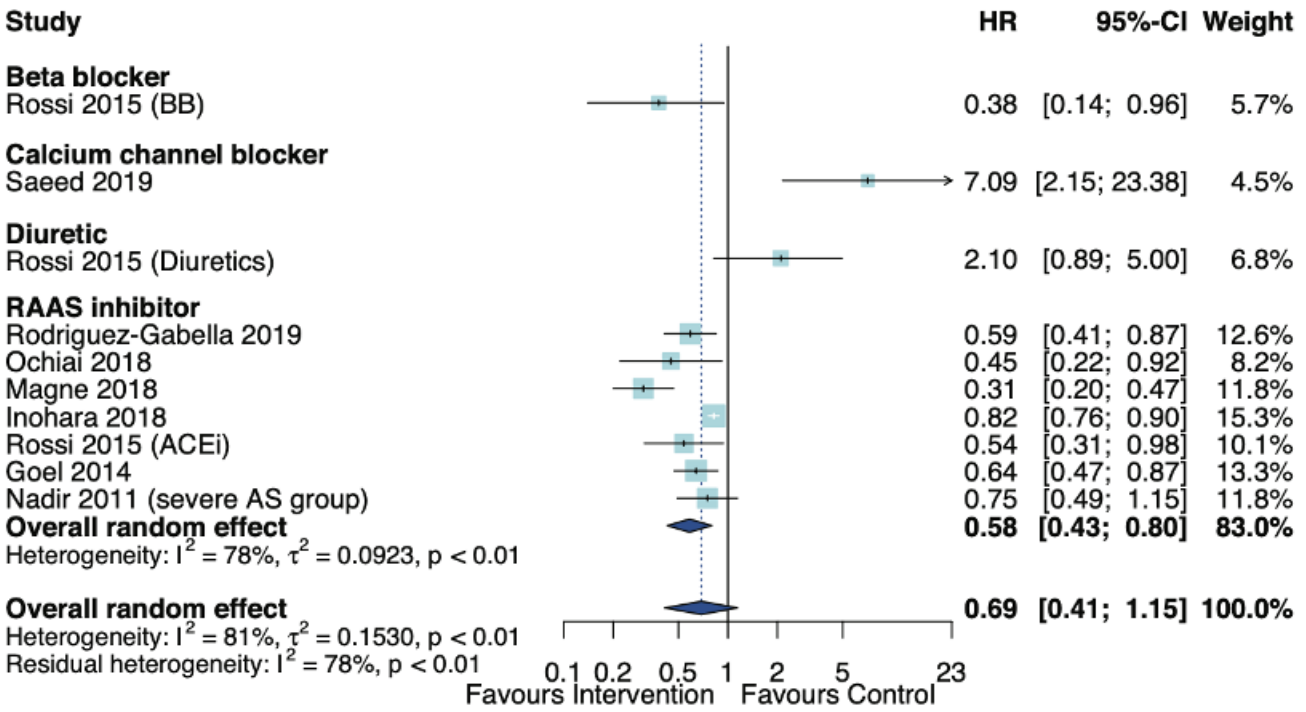


Figure 4 Forest plot of the effect of antihypertensive therapies on HR of all-cause mortality at follow-up. ACEi, ACE inhibitor; AS, aortic stenosis; RAAS, renin-angiotensin and aldosterone systems.

ESC European Society of Cardiology

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CURRENT OPINION
Hypertension

Management of patients with combined arterial hypertension and aortic valve stenosis: a consensus document from the Council on Hypertension and Council on Valvular Heart Disease of the European Society of Cardiology, the European Association of Cardiovascular Imaging (EACVI), and the European Association of Percutaneous Cardiovascular Interventions (EAPCI)

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Box 5 Expert panel consensus

- Antihypertensive drug treatment should be initiated in patients with aortic stenosis (AS) at a blood pressure (BP) ≥140/90 mmHg (≥160/90 mmHg in patients >80 years).
- A target BP of 130–139/80–90 mmHg is advisable in most patients, if well tolerated.
- A BP target <120/70 mmHg should be avoided.
- Angiotensin-converting enzyme inhibitors or angiotensin receptor blockers should be considered as first line therapy for antihypertensive treatment.
- β-Blockers may be considered in hypertensive patients with AS and concomitant compelling indications such as coronary artery disease or arrhythmias.

Box 6 Expert panel consensus

- Blood pressure (BP) should be optimally controlled before aortic valve replacement (AVR), irrespective of the chosen procedure (surgical or transcatheter valve replacement).
- BP should be carefully managed in the early post-operative phase, because the increase in systolic BP after AVR may induce pulmonary oedema and acute heart failure.
- Arterial hypertension in stabilized patients after AVR should be managed according to guidelines to reduce morbidity and mortality.

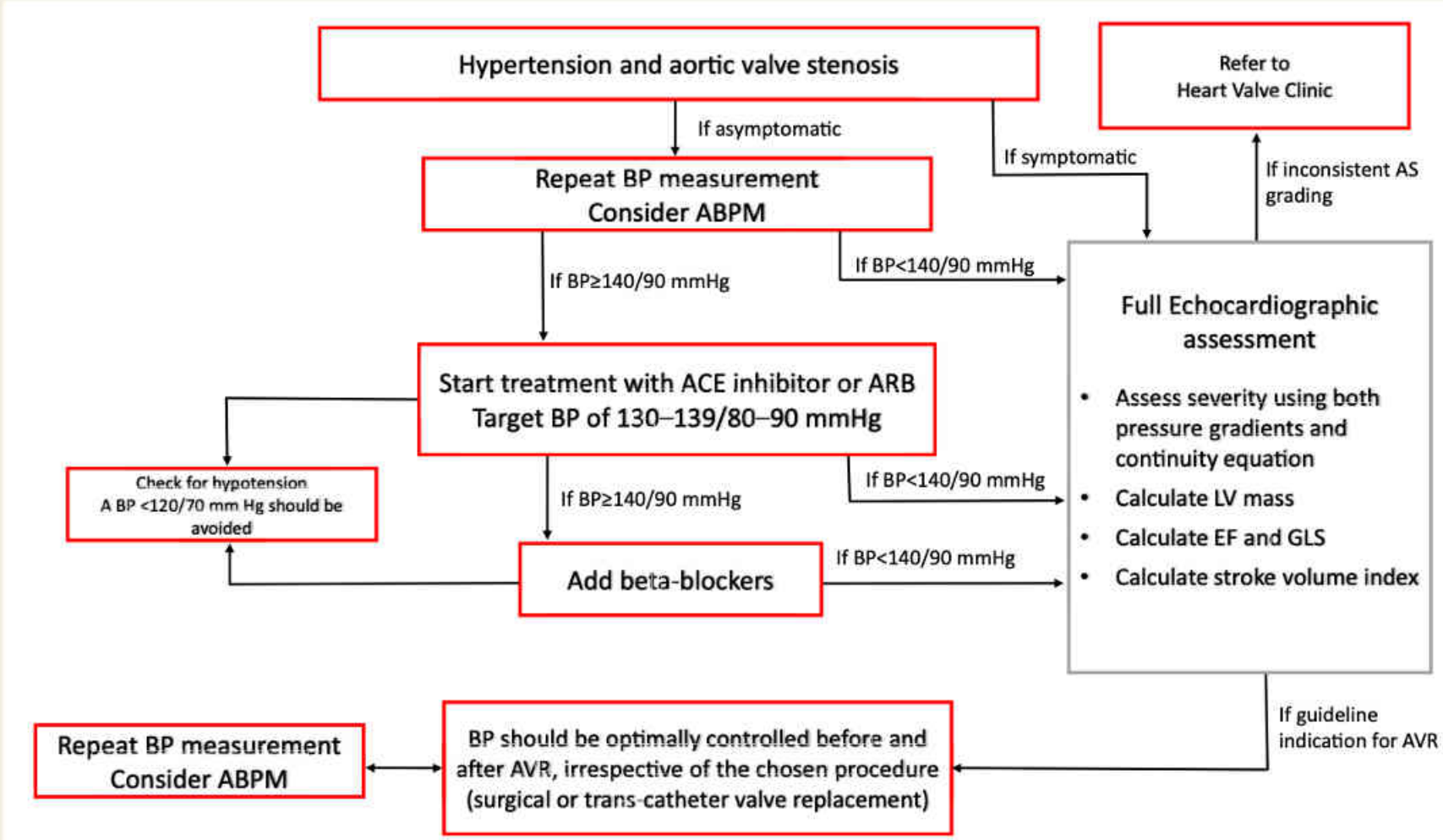


Figure 2 Flowchart for management of patients with combined arterial hypertension and aortic stenosis.

COCIS 2017: sports classified into five groups

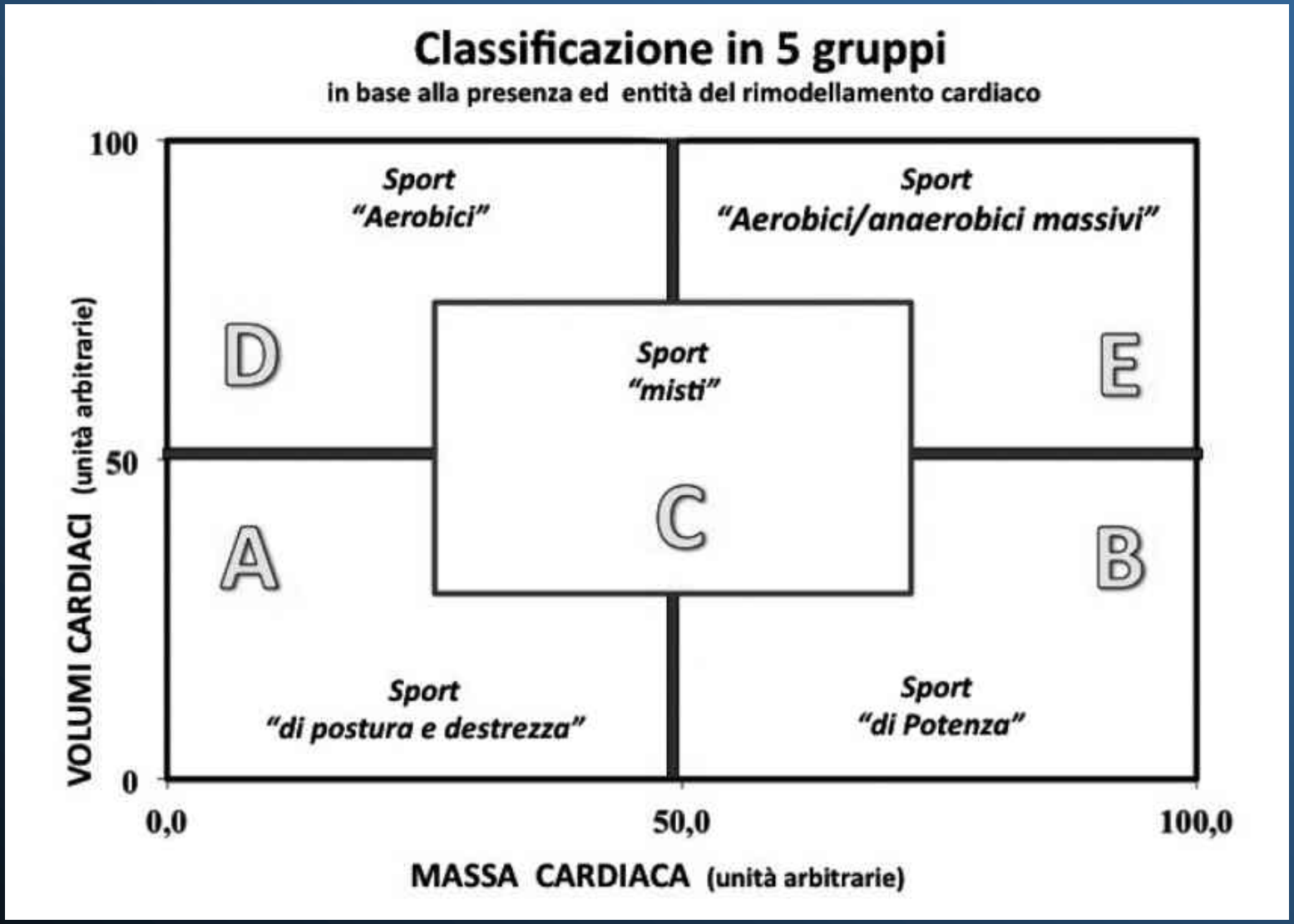
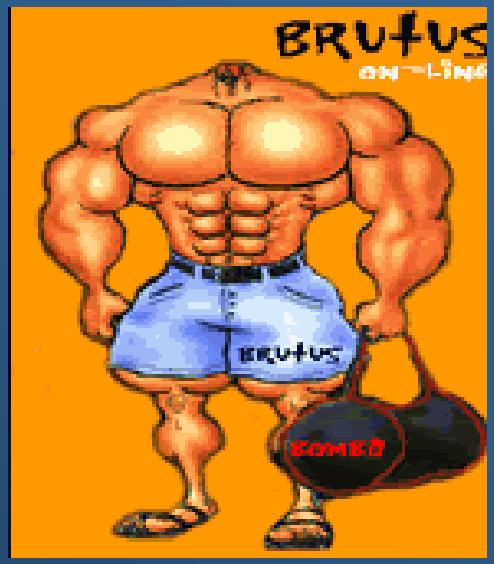


Tabella 1 - Classificazione delle attività fisiche e sportive (parte I)			
ATTIVITÀ DINAMICHE AD IMPEGNO CARDIOVASCOLARE COSTANTE			
Intensità*			
	Lieve	Moderata	Elevata
Attività Fisiche	Camminare 3-4 km/h	6 km/h	>6 km/h
	Pedalare <12 km/h	12-15 km/h	>15 km/h
	Nuoto lento	Nuoto moderato	Nuoto veloce
		Jogging < 8 km/h	> 10 km/h
		Pattinaggio (passeggiata)	Pattinaggio
Attività Sportive		Trekking	Canottaggio
			Mountain bike
		Sci di fondo (escurs.)	Sci di fondo
		Canoa (a. tranquilla)	Canoa
			Triathlon
			Danza Sportiva
Attività di Palestra		Aerobica (bassa intensità)	Aerobica (alto impatto)
		Step	Power Step
		Total Body CV Cross training (comb. aerobica, step, slide, ecc.)	Total Body CV Cross training (comb. aerobica, step, slide, ecc.)
	Indoor bike (endurance o per principianti)	Indoor bike (fitness)	Indoor bike (performance)
	Acquagym	Acquafitness	Acquafitness intenso
		Fitboxe	Aeroboxe
	Rebounding (scioltezza)	Rebounding fitness	Rebounding prestazione

Endurance dynamic aerobic physical activities with costant cardio-vascular performance

Tabella 1 - Classificazione delle attività fisiche e sportive (parte II)			
ATTIVITÀ DINAMICHE AD IMPEGNO CARDIOVASCOLARE INTERMITTENTE			
	Intensità*		
	Lieve	Moderata	Elevata
Attività Sportive	Tennis (doppio)	Tennis (palleggio)	Tennis (partita)
	Golf	Calcio a 5 (ludico)	Calcio a 5 (partita)
	Bocce	Pallavolo e beachvolley	Beachvolley (2 vs 2)
	Caccia e pesca sportiva	Pallacanestro (ludico)	Pallacanestro (partita)
		Tennistavolo (ludico)	Tennistavolo (partita)
		Squash/raquetball (ludico)	Squash/raquetball (partita)
Attività di Palestra	Danza / Hip hop	Aerobic Circuit Training per il fitness	Aerobic Circuit Training per la prestazione
	Interval Training (per principianti)	Interval Training per il fitness	Interval Training per la prestazione
ATTIVITÀ STATICHE O DI POTENZA			
Attività Sportive		Scherma	Sollevamento pesi
		Equitazione	Body building
		Windsurf	Sci alpino
			Sci nautico
			Arrampicata sportiva
Attività di Palestra	Corpo libero	Pump/Bodypump/ Push	Body building
	Stretching	Acquafitness con galleggianti	Acquafitness con galleggianti in acqua profonda
	Body sculpture	Acquafitness con attrezzi di attrito	Acquafitness con attrezzi di attrito in acqua profonda
	Pilates/Yoga	Yoga per il fitness	Power Yoga
	Tai chi chuan		
	Qi Gong		

Power static anaerobic physical activities with intermittent cardio-vascular performance



REVIEW ARTICLE

Arterial hypertension and aortic valve stenosis: Shedding light on a common "liaison"

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