Mesa: Cardiología del ejercicio

Efectos cardiovasculares del deporte de elte

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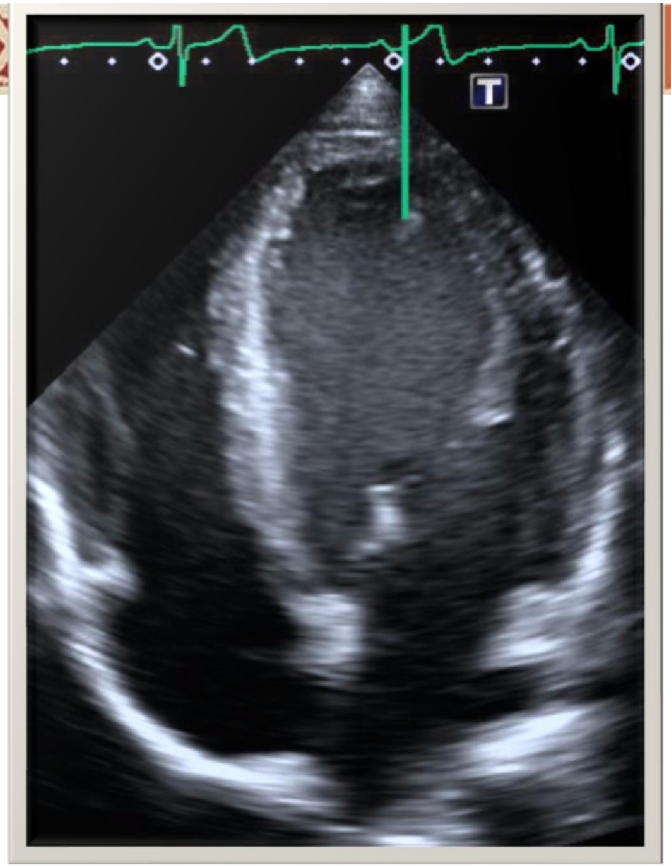


- ✓ **El Corazón del deportista es objeto de estudio por los cambios anatomo-funcionales que produce el entrenamiento.**
- ✓ **Diferentes condicionantes determinan las adaptaciones del corazón del deportista.**
- ✓ **El tipo de ejercicio predominante ejerce una influencia distinta en función:**
  - **tipo de contracción muscular**
  - **las características bioenergéticas**
  - **componente estático y dinámico**

Preguntas

- ¿Donde está el límite de las bradiarritmias y taquiarritmias?
- ¿Cual es el limite de la adaptación fisiológica del deportista?
- ¿Las adaptaciones dependen de la raza o de la genética?
- ¿La adaptación implica disfunción ventricular tanto sistólica como diastólica?

Bradicardia Sinusal

La bradicardia sinusal (40-60 lpm) es el trastorno del ritmo más frecuente

Prevalencia: 4-8 % población no seleccionada

50-100% deportes resistencia aeróbica

Zeppilli P. Cardiologia dello Sport. Roma: CESI, 1996; 149.

Bradicardia < de 40 lpm es difícil de encontrar incluso en deportistas con alto nivel de entrenamiento

Bjornstad H. Cardiology 1994; 84: 42-50.

Atletas de ultraresistencia: FC media 53±10 lpm

Douglas PSAm Heart J 1988; 116: 784.

Corredores de larga distancia veteranos (Holter):

Bradicardia extrema <35 lpm

Pausas patológicas

Bloqueo A-V

Northcote RJ. Br Heart J 1989; 61: 155-160.

Frecuencia cardiaca en el ECG de reposo
Deportistas españoles de alta competición

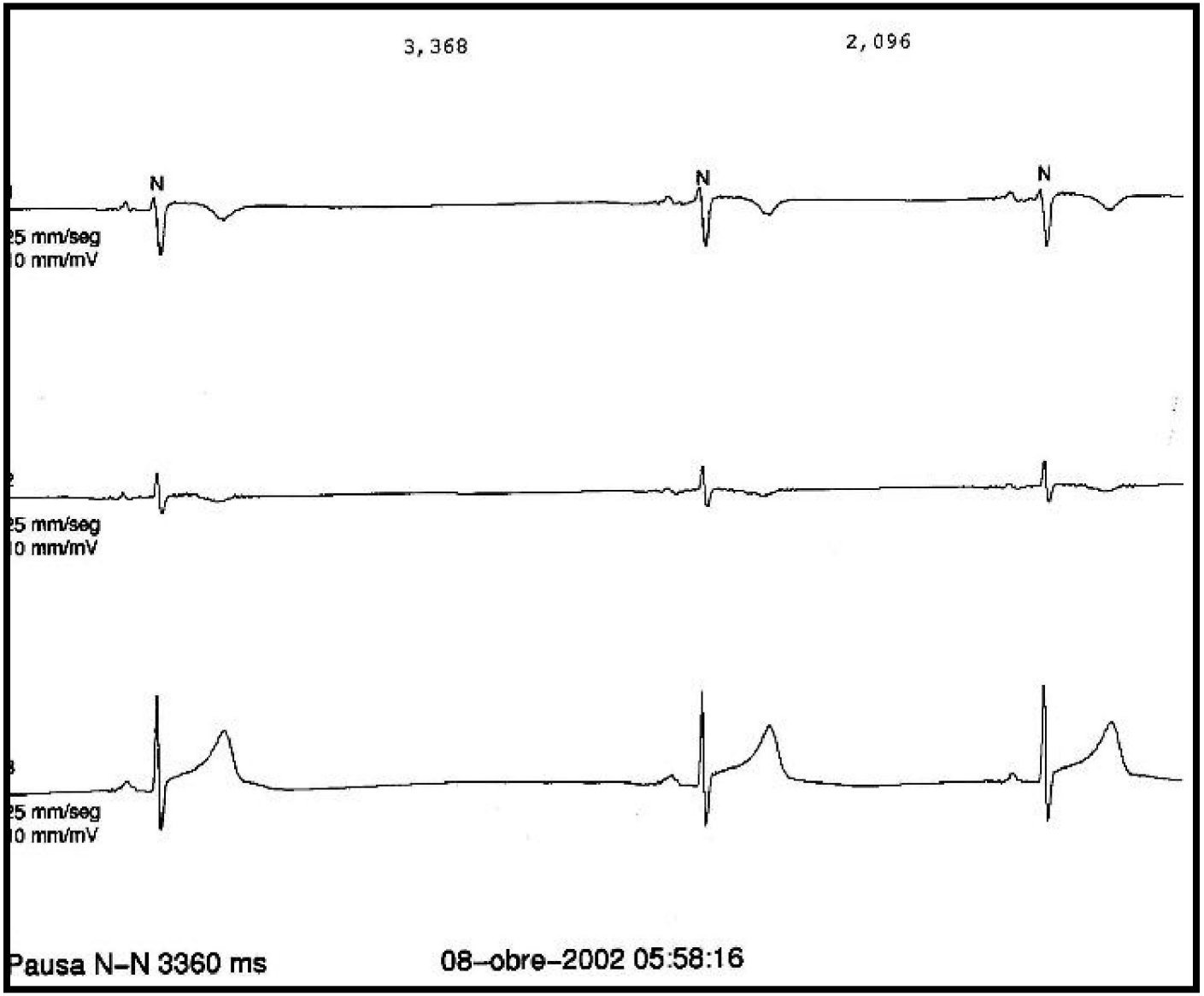
Latidos/minuto	FC en ECG REPOSO			
	Hombres		Mujeres	
	Total	%	Total	%
Menos de 30 lpm	0	0	1	0,05
31-39	53	1,6	7	0,4
40-49	554	16,5	172	9,7
50-59	1061	31,6	449	25,2
60-69	1104	32,9	653	36,7
70-79	444	13,2	359	20,2
>80	139	4,1	139	7,8
N	3355		1780	

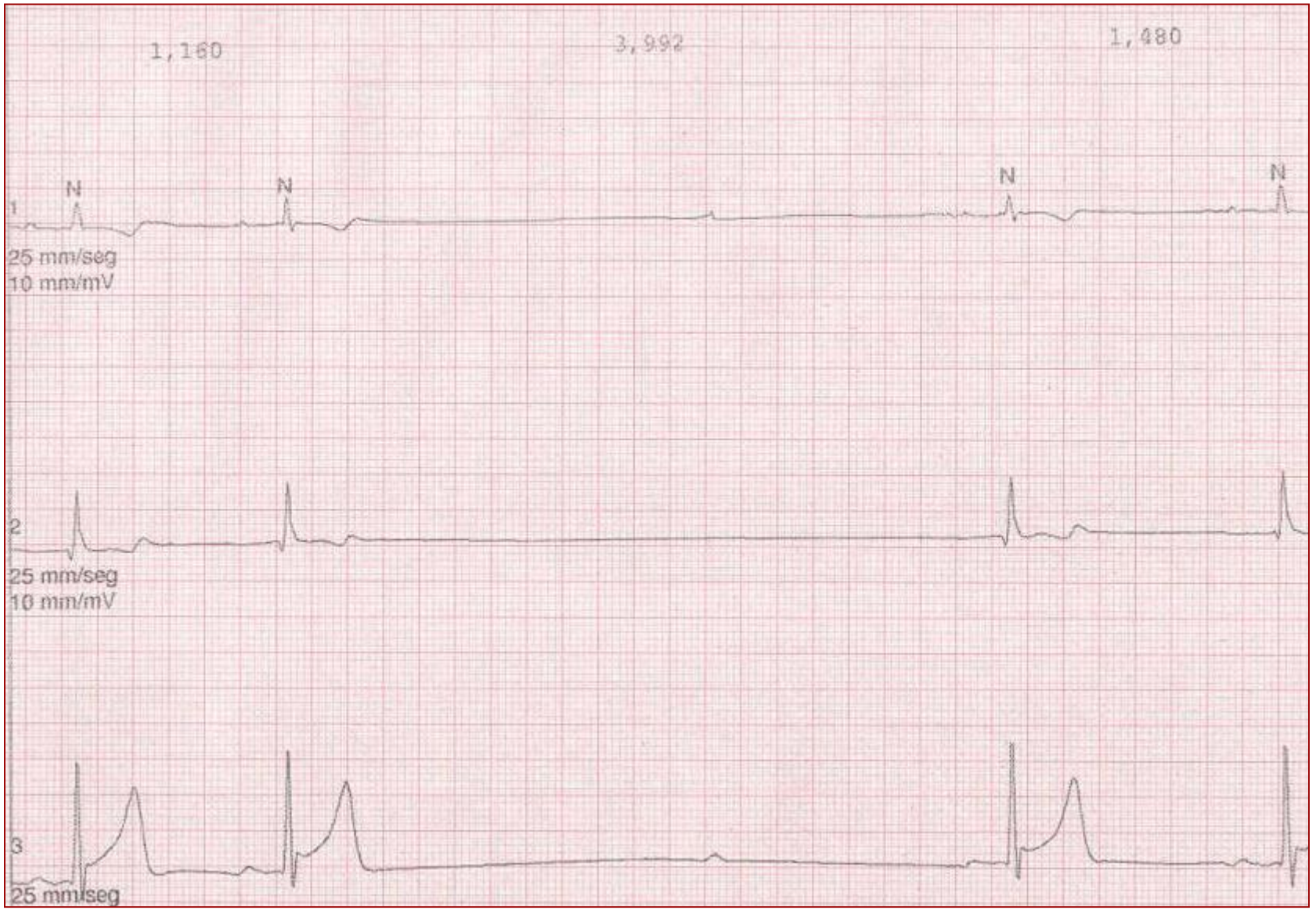
Boraita A. Arritmias en el deportista. En: Arritmias manejo practico 2016

Frecuencias cardiacas mínimas diurna y nocturna en el Holter
Deportistas españoles de alto nivel

Frecuencia mínima diurna	FC en el HOLTER			
	Hombres n=572		Mujeres n=177	
	Total	%	Total	%
Menos de 30 lpm	7	1,2	2	1,1
31-39	158	27,6	37	20,9
40-49	289	50,5	81	45,8
50-59	105	18,4	39	22
Frecuencia mínima nocturna				
Menos de 30 lpm	66	11,5	8	4,5
31-39	350	61,2	77	43,5
40-49	120	21	75	42,4
50-59	8	1.4	11	6,2

Boraita A. Arritmias en el deportista. En: Arritmias manejo practico 2016


3,368
2,096
N
N
N
25 mm/seg
10 mm/mV
25 mm/seg
10 mm/mV
25 mm/seg
10 mm/mV
Pausa N-N 3360 ms
08-obre-2002 05:58:16

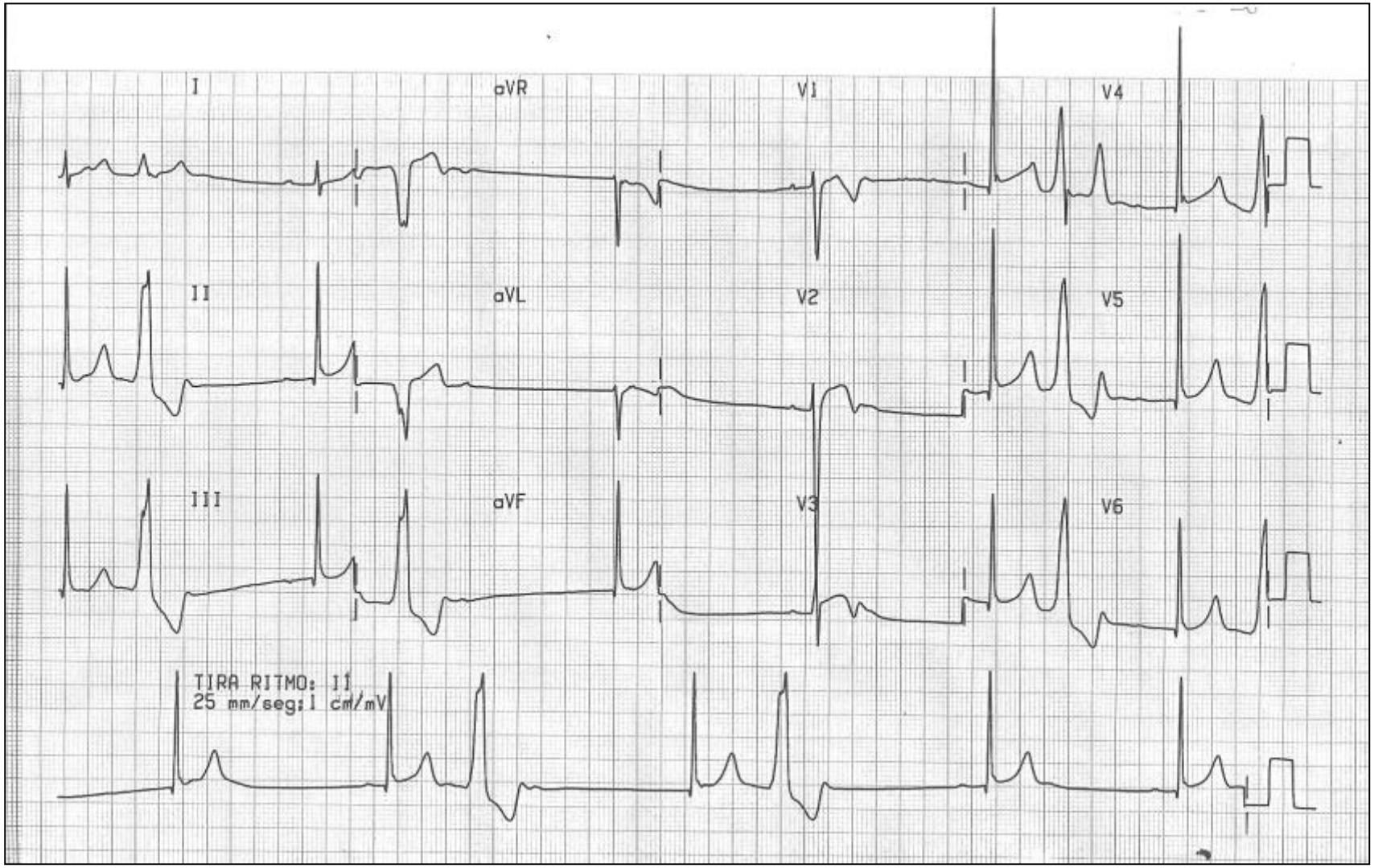

1,160
3,992
1,480
N
N
N
N
1
25 mm/seg
10 mm/mV
2
25 mm/seg
10 mm/mV
3
25 mm/seg

Incidencia de bloqueo aurículo-ventricular en el Holter
Deportistas españoles de alto nivel

BLOQUEO A-V	HOLTER			
	Hombres		Mujeres	
	Total	%	Total	%
PRIMER GRADO	84	14,7	22	12,4
2º TIPO I	96	16,8	27	15,3
2º TIPO II	10	1,8	3	1,7
ALTO GRADO	6	1	0	0
N	572		177	

Boraita A. Arritmias en el deportista. En: Arritmias manejo practico 2016

Deportistas con EV y/o palpitaciones



Incidencia de extrasistolia ventricular

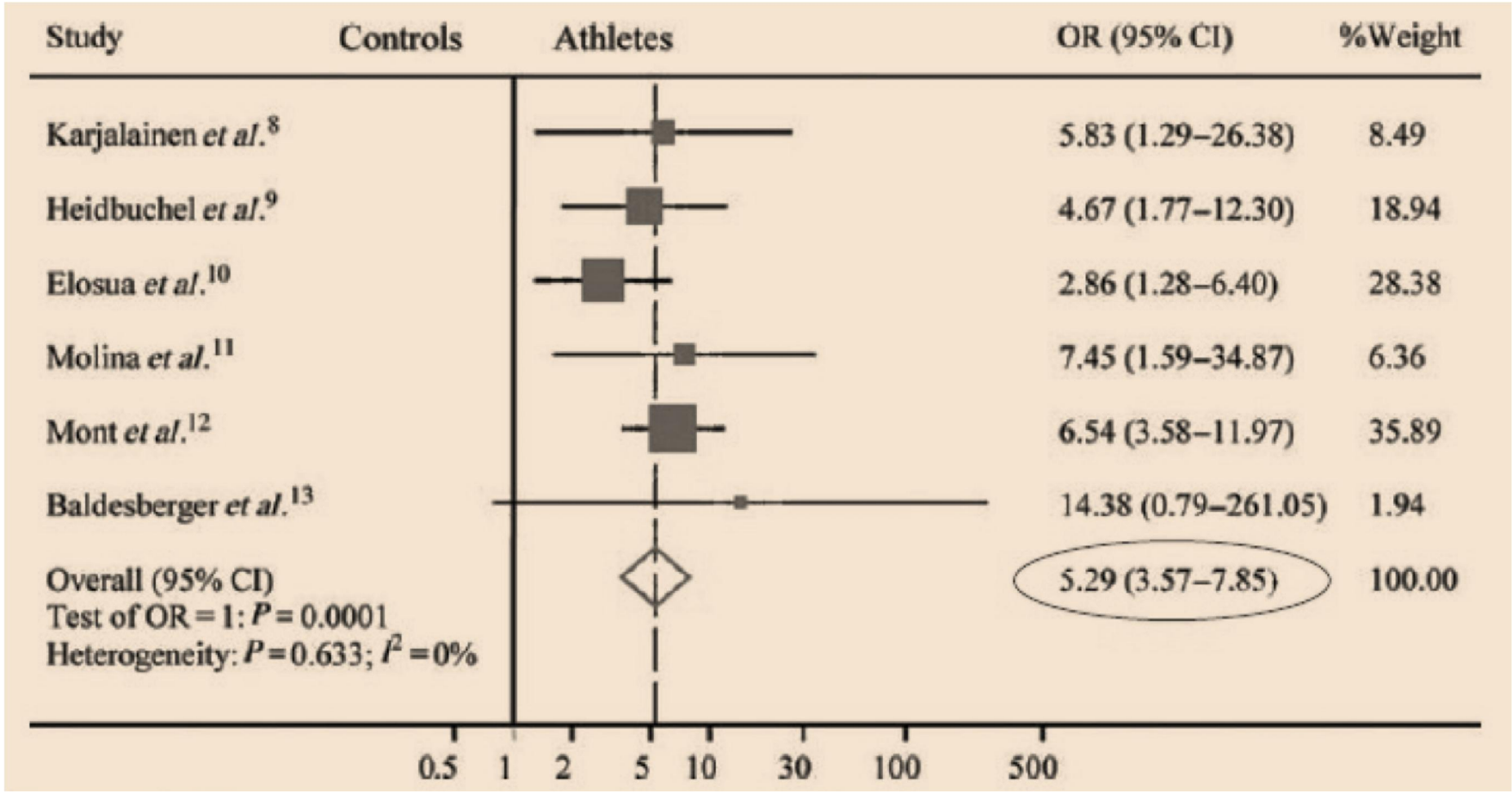
- ECG basal 1,3%
- ECG de esfuerzo 11 %
- ECG de Holter 35 %

Incidencia de extrasistolia ventricular en Holter
Deportistas españoles de alto nivel

Extrasístoles ventriculares	Hombres n = 572		Mujeres n = 177	
	Total	%	Total	%
< 100	186	32,5	60	33,9
100-999	36	6,3	9	5,1
≥1000	32	5,6	12	6,8
Cualquier grado de EV	254	44,4	81	45,8

Boraita A. Arritmias en el deportista. En: Arritmias manejo practico 2007: 579-606

FIBRILACION AURICULAR EN EL DEPORTISTA



Abdulia J, Nielsen JR, Europace 2009

FIBRILACION AURICULAR EN EL DEPORTISTA

Prevalence and Clinical Significance of Left Atrial Remodeling in Competitive Athletes

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Rome, Italy; and Minneapolis, Minnesota

OBJECTIVES In the present study we assessed the distribution and clinical significance of left atrial (LA) size in the context of athlete's heart and the differential diagnosis from structural heart disease, as well as the proclivity to supraventricular arrhythmias.

BACKGROUND The prevalence, clinical significance, and long-term arrhythmic consequences of LA enlargement in competitive athletes are unresolved.

METHODS We assessed LA dimension and the prevalence of supraventricular tachyarrhythmias in 1,777 competitive athletes (71% of whom were males), free of structural cardiovascular disease, that were participating in 38 different sports.

RESULTS The LA dimension was 23 to 50 mm (mean, 37 ± 4 mm) in men and 20 to 46 mm (mean, 32 ± 4 mm) in women and was enlarged (i.e., transverse dimension ≥40 mm) in 347 athletes (20%), including 38 (2%) with marked dilation (≥45 mm). Of the 1,777 athletes, only 14 (0.8%) had documented, symptomatic episodes of either paroxysmal atrial fibrillation (n = 5; 0.3%) or supraventricular tachycardia (n = 9; 0.5%), which together occurred in a similar proportion in athletes with (0.9%) or without (0.8%; p = NS) LA enlargement. Multivariate regression analysis showed LA enlargement in athletes was largely explained by left ventricular cavity enlargement (R^2 = 0.53) and participation in dynamic sports (such as cycling, rowing/canoeing) but minimally by body size.

CONCLUSIONS In a large population of highly trained athletes, enlarged LA dimension ≥40 mm was relatively common (20%), with the upper limits of 45 mm in women and 50 mm in men distinguishing physiologic cardiac remodeling ("athlete's heart") from pathologic cardiac conditions. Atrial fibrillation and other supraventricular tachyarrhythmias proved to be uncommon (prevalence <1%) and similar to that in the general population, despite the frequency of LA enlargement. Left atrial remodeling in competitive athletes may be regarded as a physiologic adaptation to exercise conditioning, largely without adverse clinical consequences. (J Am Coll Cardiol 2005;46:690–6) © 2005 by the American College of Cardiology Foundation

- **1777 deportistas de competición la incidencia de FA fue 0,2%**
- **Edad 24±6 años y media de 6 años entrenamiento**

Pelliccia A. et al. JACC 2005

JAMA Cardiology | Brief Report

Incidence of Atrial Fibrillation in Elite Athletes

Araceli Boraita, MD, PhD; Alejandro Santos-Lozano, PhD; María E. Heras, MD, PhD; Florencia González-Amigo, MD; Susana López-Ortiz, BSc; Julián P. Villacastín, MD, PhD; Alejandro Lucia, MD, PhD

IMPORTANCE Vigorous exercise (particularly endurance sports) might increase the risk of atrial fibrillation (AF), but there is variability in the reported frequency of this condition among elite athletes. The

OBJECTIVE To determine potential risk factors.

DESIGN, SETTING, AND PA athletes (N = 6813) refer January 1, 1997, to Decem compare athletes with ar and the studied athletes Cardiologists responsible condition (AF or no AF) o

EXPOSURES All participa at time of AF diagnosis in

MAIN OUTCOMES AND ME electrocardiogram, and/c dimensions.

RESULTS A total of 6813 Spanish elite athletes (2385 [35.0%] women) were referred for cardiac evaluation during the study period. Mean (SD) age was 22 (7) years, and mean (SD) time of competition was 8 (5) years. Only 21 athletes (1 woman), participating in different types of sports, had AF (ie, paroxysmal [n = 18], persistent [n = 1], or long-standing persistent [n = 2]) during the 20-year study. In multivariate analysis, increasing values of age (odds ratio [OR], 1.07; 95% CI, 1.00-1.14), years of competition (OR, 1.14; 95% CI, 1.07-1.22), and left atrial anteroposterior diameter (OR, 1.21; 95% CI, 1.10-1.32) were associated with higher AF risk.

CONCLUSIONS AND RELEVANCE The incidence of AF is low among young Spanish elite athletes, even when considering only endurance athletes. Yet, potential contributors (particularly atrial remodeling) need to be monitored.

Table 2. Associations With AF Risk in Spanish Elite Athletes

	Logistic Regression, OR (95% CI)		Association Cutoff Value	Receiver Operator Curves for Cutoff Values		
Variable	Univariate	Multivariate, Stepwise Forward		AUC (95% CI)	Sensitivity, Specificity, %	*P* Value
Sex (male)	11.02 (1.48-82.23)[a]	NS				
Age	1.18 (1.14-1.22)[b]	1.07 (1.00-1.14)[c]	27 y	0.87 (0.76-0.97)	85, 81	<.001
Years of competition	1.15 (1.11-1.19)[b]	1.14 (1.07-1.22)[b]	14 y	0.86 (0.76-0.96)	80, 86	<.001
Endurance sport	2.58 (1.10-6.11)[c]	NS				
RA.Sid	1.20 (1.13-1.29)[b]	NS	55 mm	0.77 (0.65-0.89)	75, 72	<.001
LA.Sid	1.16 (1.09-1.25)[b]	NS	54 mm	0.70 (0.56-0.84)	71, 70	.001
LA.APd	1.32 (1.22-1.43)[b]	1.21 (1.10-1.32)[b]	41 mm	0.83 (0.71-0.95)	70, 92	<.001
Left atrial sphericity index[d]	1.10 (1.06-1.14)[b]	NS	79%	0.72 (0.59-0.85)	50, 89	.001

Prevalencia de FA en DAN españoles 0,3%

Heart, Lung and Circulation (2017) xx, 1–7
1443-9506/04/$36.00
http://dx.doi.org/10.1016/j.hlc.2017.05.132

REVIEW

State of the Art Review: Atrial Fibrillation in Athletes

M. Darragh Flannery, MBBS [a,b], Jonathan M. Kalman, MBBS, PhD [b,c], Prashanthan Sanders, MBBS, PhD [d], André La Gerche, MBBS, PhD [a,b,e*]

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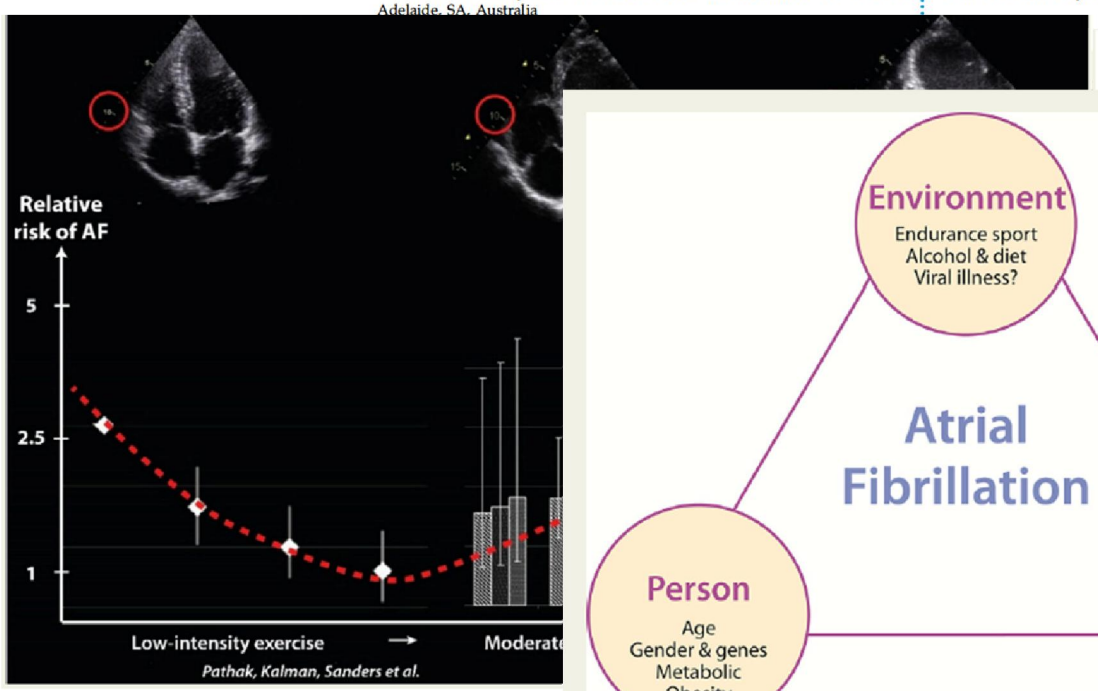
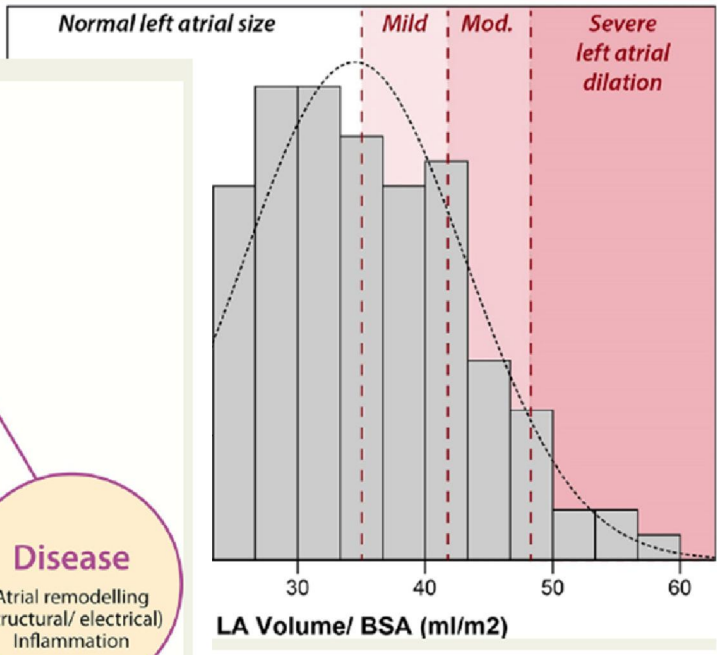
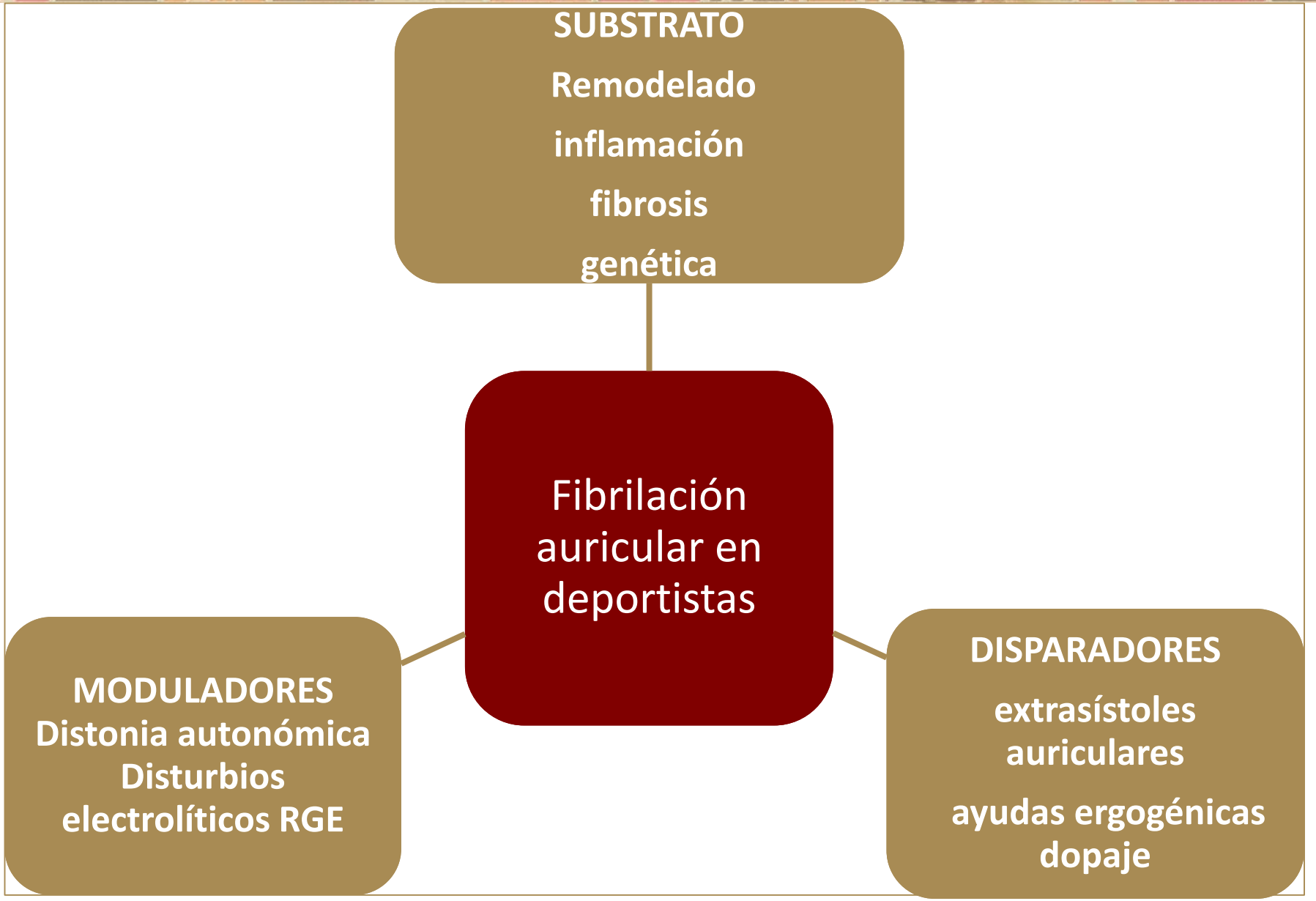




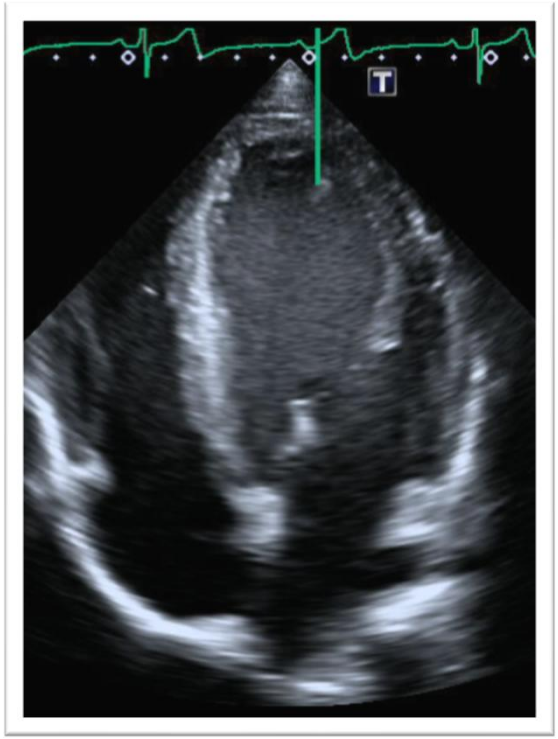
Flannery MD et al. Heart, Lung and Circulation 2017


SUBSTRATO
Remodelado
inflamación
fibrosis
genética
Fibrilación auricular en deportistas
MODULADORES
Distonia autonómica
Disturbios electrolíticos RGE
DISPARADORES
extrasístoles auriculares
ayudas ergogénicas dopaje

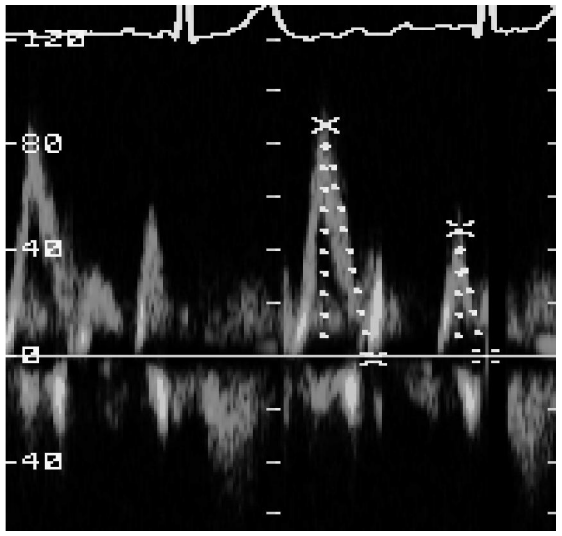
Corazón del deportista

- > dimensión VI y VD
- > espesores parietales
- > dimensión AI y AD

HVI y HVD

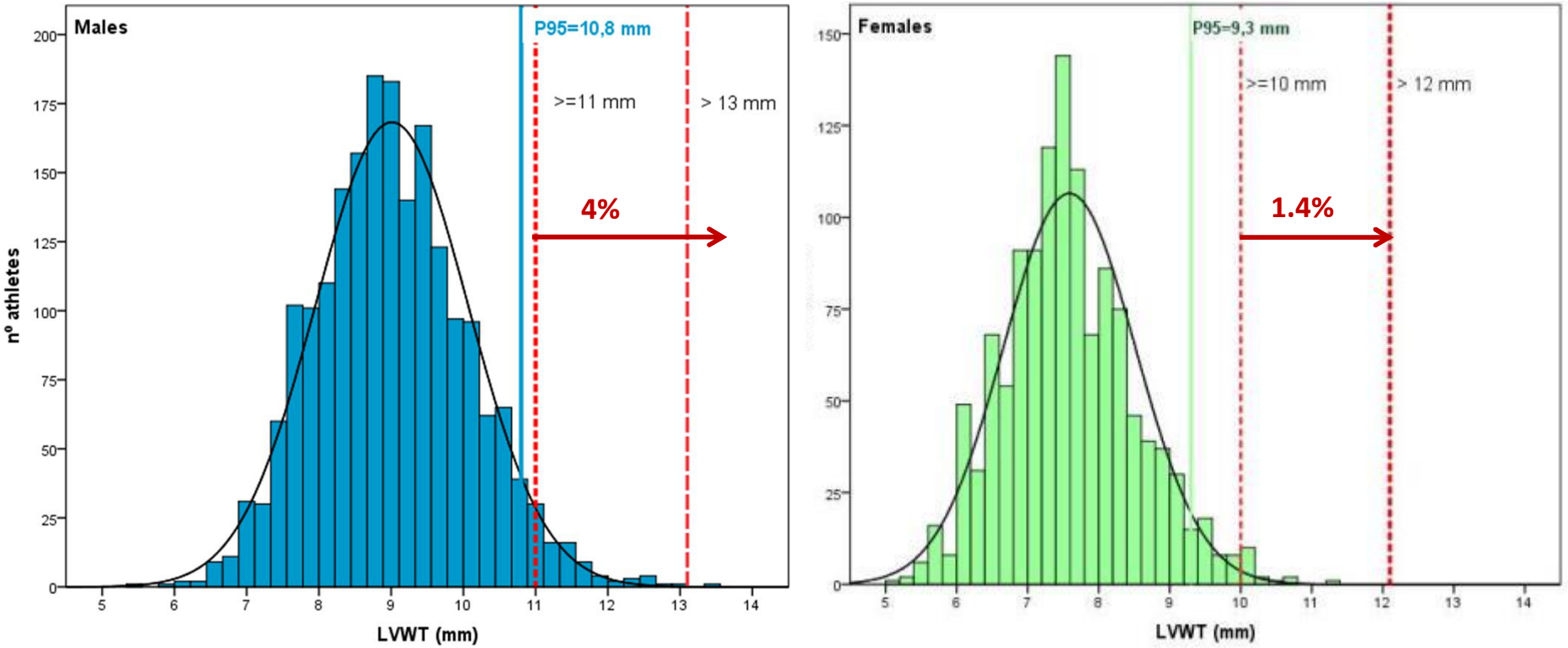


- > volumen sistólico
- Mejora del llenado diastólico
  - > velocidad pico onda E
  - < velocidad pico onda A
  - > E/A
  - =TDE y TDA
  - = TRI t TRIc
  - > tiempo de diástasis



Limite superior de la hipertrofia fisiológica en deportista españoles caucasianos de alto nivel 2005 Hombres y 1239 Mujeres (Consejo Superior de Deportes)

Espesores parietales del VI

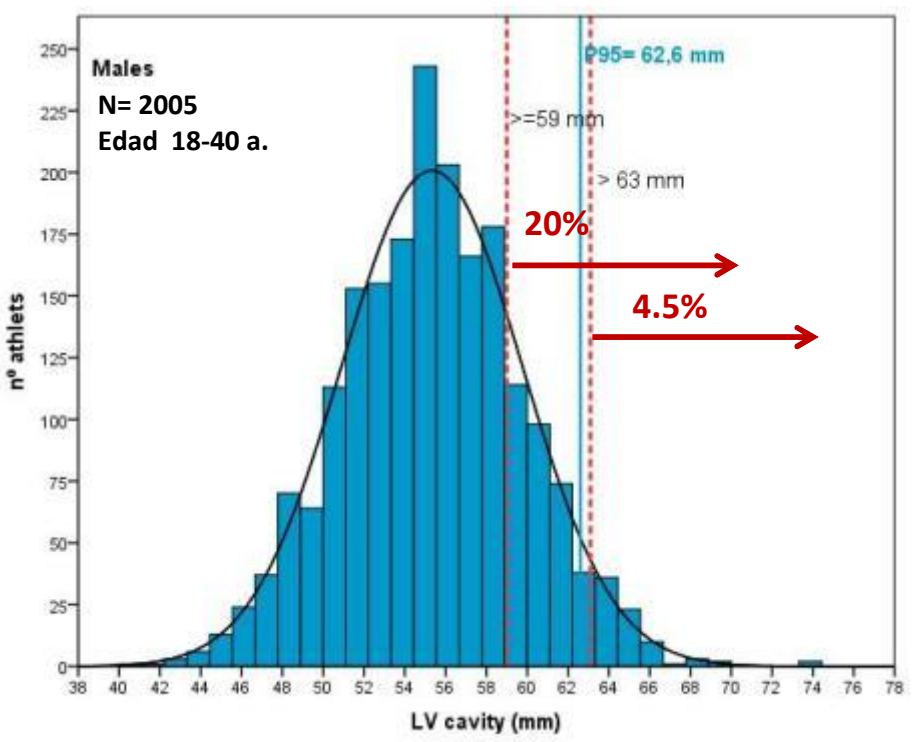


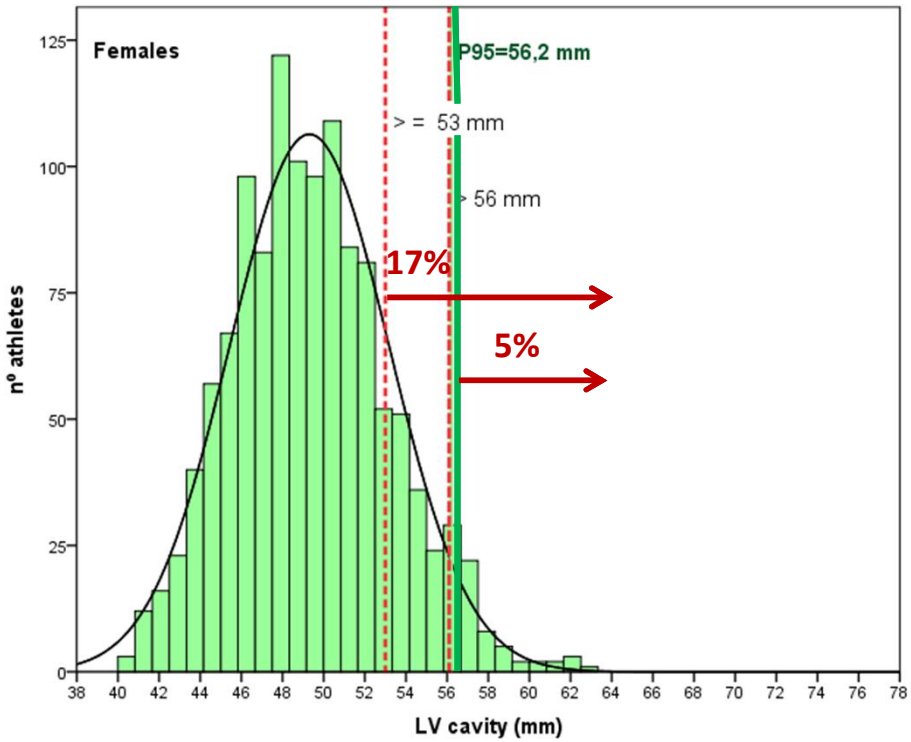
- **Edad: 18-40 a. hombres (23.7±5 a.)**
  16-40 a. mujeres (21.4±4.9 a)
- **Años de entrenamiento: 8.9±4.8 a.**
- **Horas/sem: 19.2±9.1 h.**
- **45 deportes**

Boraita A. Tesis doctoral, U. Autónoma, Facultad de Medicine, Madrid, España, 2014

Limite superior de la hipertrofia fisiológica en deportista españoles caucasianos de alto nivel 2005 Hombres y 1239 Mujeres (Consejo Superior de Deportes)

dimensión diastólica del VI

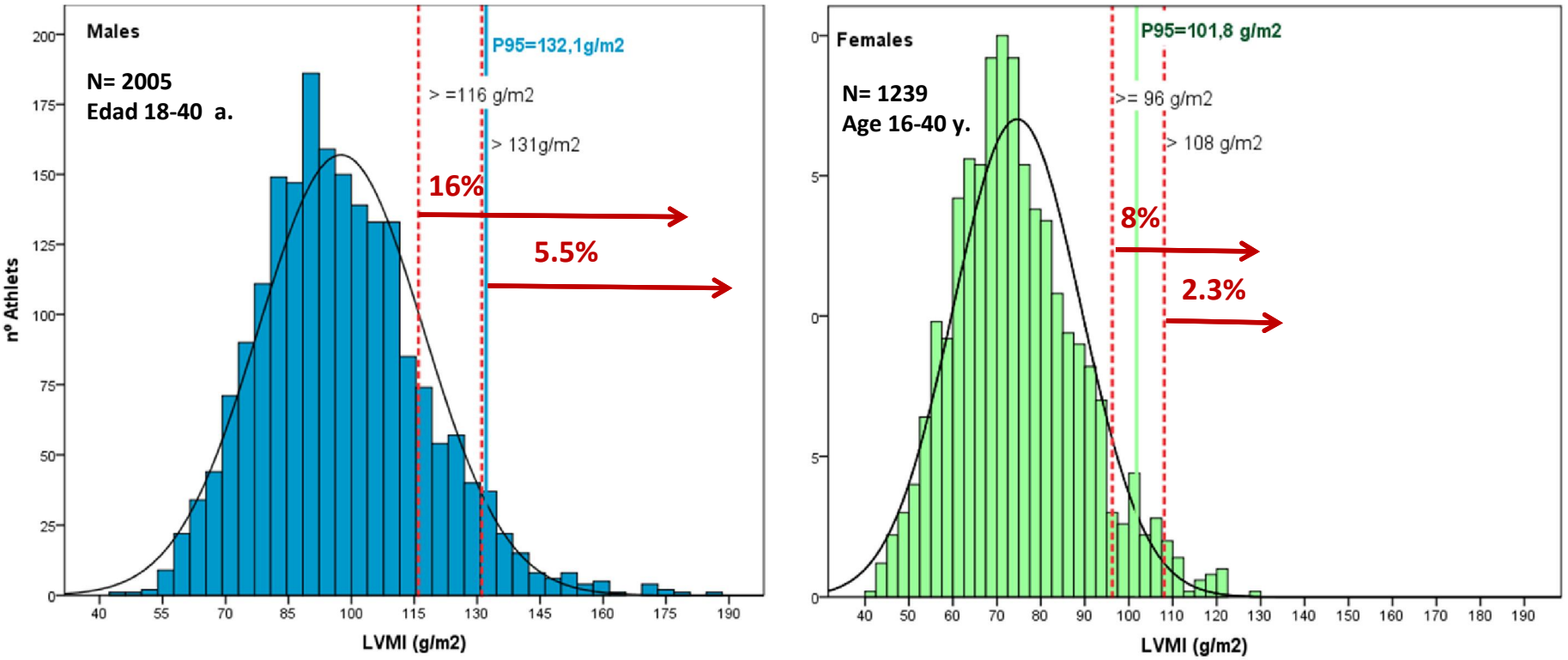




>100 deportistas: atletismo, judo, baloncesto, hockey, triatlón, natación, fútbol, tiro olímpico, Rugby, piragüismo, esgrima, ciclismo

Limite superior de la hipertrofia fisiológica en deportista españoles caucasianos de alto nivel 2005 Hombres y 1239 Mujeres (Consejo Superior de Deportes)

Masa ventrículo izquierdo



Limite superior de la hipertrofia fisiológica en deportista españoles caucasianos de alto nivel

Limite superior de la HVI en deportistas de elite españoles caucasianos Percentil 95		
	HOMBRES (n = 2005)	MUJERES (n = 1239)
Grosor medio parietal (mm)	10,8	9,25
Dimensión telediastólica (mm)	62,6	56,2
Masa ventricular /SC (g/m^2)	132,1	101,8
Grosor relativo parietal	0,40	0,37

- ✓ Edad
- ✓ Sexo
- ✓ Etnia
- ✓ Tamaño
- ✓ Deporte

Boraita A. Tesis doctoral, U. Autónoma, Facultad de Medicine, Madrid, España, 2014

¿La aorta sigue el mismo comportamiento adaptativo que resto de las cavidades?

Epidemiology

Reference Values of Aortic Root in Male and Female White Elite Athletes According to Sport

2016

Araceli Boraita, MD, PhD; Maria-Eugenia Heras, MD, PhD*; Francisco Morales, MD*; Manuel Marina-Breysse, MD; Alicia Canda, MD, PhD; Manuel Rabadan, MD; Maria-Isabel Barriopedro, PhD; Amai Varela, MD; Alejandro de la Rosa, MD, PhD; José Tuñón, MD, PhD

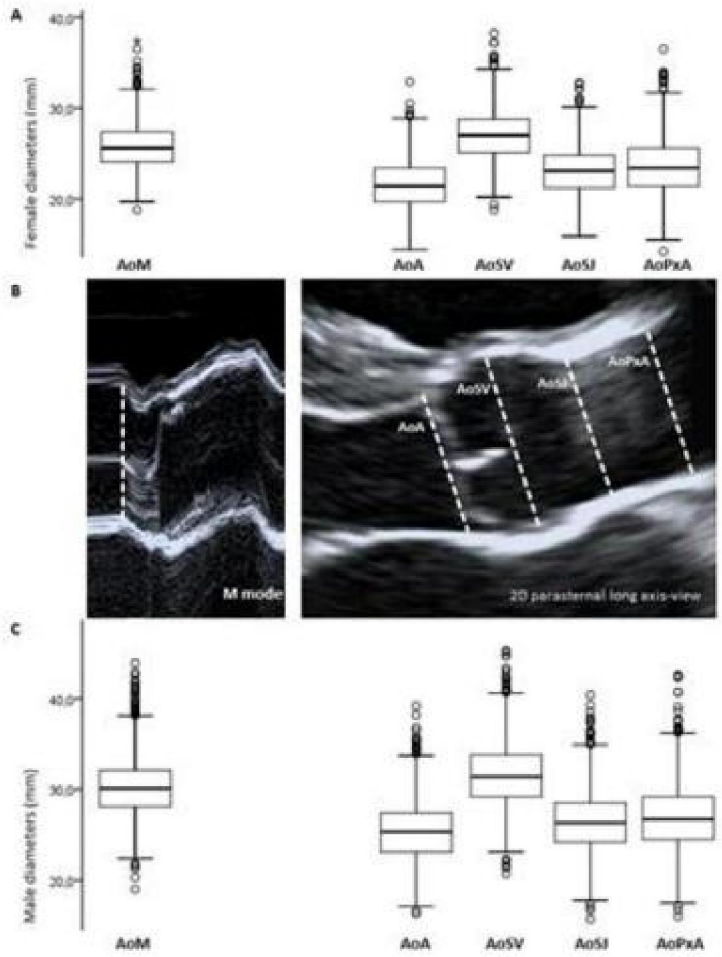
Background—There is limited information regarding the aortic root upper physiological limits in all planes in elite athletes according to static and dynamic cardiovascular demands and sex.

Methods and Results—A cross-sectional study was performed in 3281 healthy elite athletes (2039 men and 1242 women) aged 23.1±5.7 years, with body surface area of 1.9±0.2 m^2 and 8.9±4.9 years and 19.2±9.6 hours/week of training. Maximum end-diastolic aortic root diameters were measured in the parasternal long axis by 2-dimensional echocardiography. Age, left ventricular mass, and body surface area were the main predictors of aortic dimensions. Raw values were greater in males than in females ($P<0.0001$) at all aortic root levels. Dimensions corrected by body surface area were higher in men than in women at the aortic annulus (13.1±1.7 versus 12.9±1.7 mm/m^2; $P=0.007$), without significant differences at the sinus of Valsalva (16.3±1.9 versus 16.3±1.9 mm/m^2; $P=0.797$), and were smaller in men at the sinotubular junction (13.6±1.8 versus 13.8±1.8 mm/m^2; $P=0.008$) and the proximal ascending aorta (13.8±1.9 versus 14.1±1.9 mm/m^2; $P=0.001$). Only 1.8% of men and 1.5% of women had values >40 mm and 34 mm, respectively. Raw and corrected aortic measures at all levels were significantly greater in sports, with a high dynamic component in both sexes, except for corrected values of the sinotubular junction in women.

Conclusions—Aortic root dimensions in healthy elite athletes are within the established limits for the general population. This study describes the normal dimensions for healthy elite athletes classified according to sex and dynamic and static components of their sports. (***Circ Cardiovasc Imaging*. 2016;9:e005292. DOI: 10.1161/CIRCIMAGING.116.005292.)**

2.742 hombres (64,3%) + 1.525 mujeres (35,7%) = 4.267 total

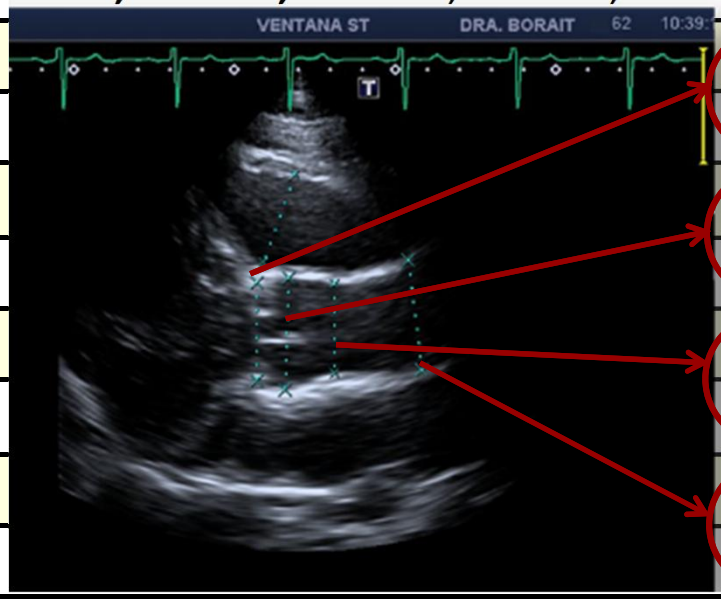
Años entrenamiento: 8 ± 4,9 a
Horas entrenamiento: 19 ± 9,6 horas/sem



Boraita A et al. Reference values aortic root in elite athletes. CIRCCVIM 2016.

Dimensiones de la aorta en modo M y 2D

Hombres 2742, mujeres 1525		Media	DE	Min	Max	P95
Aorta modo M/SC (mm/m^2)	Hombres	**15,6**	**1,7**	9,7	23,7	**18,6**
	Mujeres	**15,5**	**1,6**	10,8	22,4	**18,2**
Plano valvular/SC (mm/m^2)	Hombres					**16,0**
	Mujeres					**15,8**
Senos de Valsalva/SC (mm/m^2)	Hombres					**19,7**
	Mujeres					**19,4**
Anillo supra-aórtico/SC (mm/m^2)	Hombres					**16,6**
	Mujeres					**16,8**
Aorta ascendente proximal/SC (mm/m^2)	Hombres					**17,1**
	Mujeres					**17,5**



- **La raíz de la aorta No sigue los mismos patrones de adaptación fisiológica.**
- **La aorta en deportistas de élite se encuentra en el rango normal.**
- **Rara vez muestra dilatación con el entrenamiento dinámico y los cambios con el enteramiento estático son mínimos.**
- **Marcada dilatación de la raíz de aorta por encima del P95 obliga a descartar patología aortica.**

ESC European Society of Cardiology

European Heart Journal - Cardiovascular Imaging (2019) **0**, 1–9
doi:10.1093/ehjci/jez001

2019

Bicuspid aortic valve behaviour in elite athletes

Araceli Boraita[1]*, Francisco Morales-Acuna[1,2†], Manuel Marina-Breysse[1,3†], María-Eugenia Heras[1], Alicia Canda[4], María-Eugenia Fuentes[5], Antonio Chacón[5], Leonel Diaz-Gonzalez[1], Manuel Rabadan[6], Begoña Parra Laca[7], Leopoldo Pérez de Isla[7], and José Tuñón[8]

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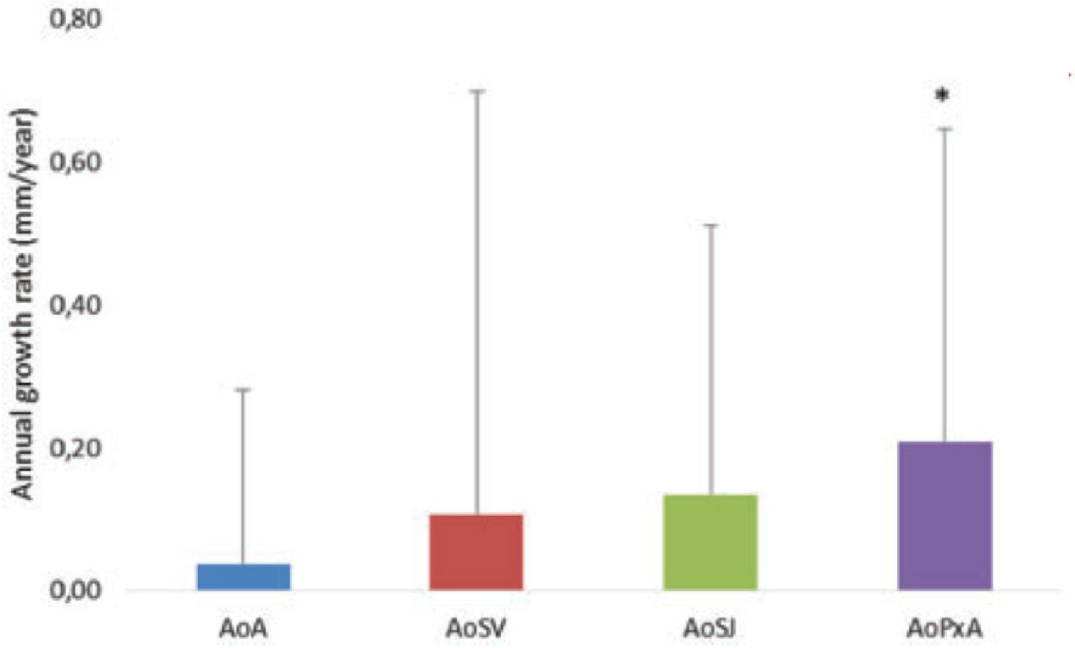
Received 27 July 2018; editorial decision 3 January 2019; accepted 7 January 2019

Aims To determine the prevalence and characteristics of bicuspid aortic valve (BAV) among elite athletes and to analyse the effect of long-term exercise training on their aortas.

Methods and results Consecutive BAV and tricuspid aortic valve (TAV) elite athletes from a population of 5136 athletes evaluated at the Sports Medicine Center of the Spanish National Sports Council were identified using echocardiography. A total of 41 BAV elite athletes were matched with 41 TAV elite athletes, and 41 BAV non-athletic patients from three Spanish tertiary hospitals. Sixteen BAV elite athletes who had undergone at least two cardiac evaluations separated by more than 3 years were selected to assess their clinical course. The prevalence of BAV in elite athletes was 0.8%. The proximal ascending aorta was larger for both BAV groups in comparison to TAV athletes ($P = 0.001$). No differences in aortic diameters were found between BAV athletes and BAV non-athletes. In BAV elite athletes, the annual growth rates for aortic annulus, sinuses of Valsalva, sinotubular junction, and proximal ascending aorta were 0.04 ± 0.24, 0.11 ± 0.59, 0.14 ± 0.38, and 0.21 ± 0.44 mm/year, respectively. Aortic regurgitation was the only functional abnormality, but no significant progression was found.

Conclusion High-intensity training and sports competition may not aggravate BAV condition during elite athletes' careers. BAV elite athletes with mild-to-moderately dilated aortas may engage in high dynamic cardiovascular exercise without adverse consequences, although an echocardiographic follow-up is recommended.

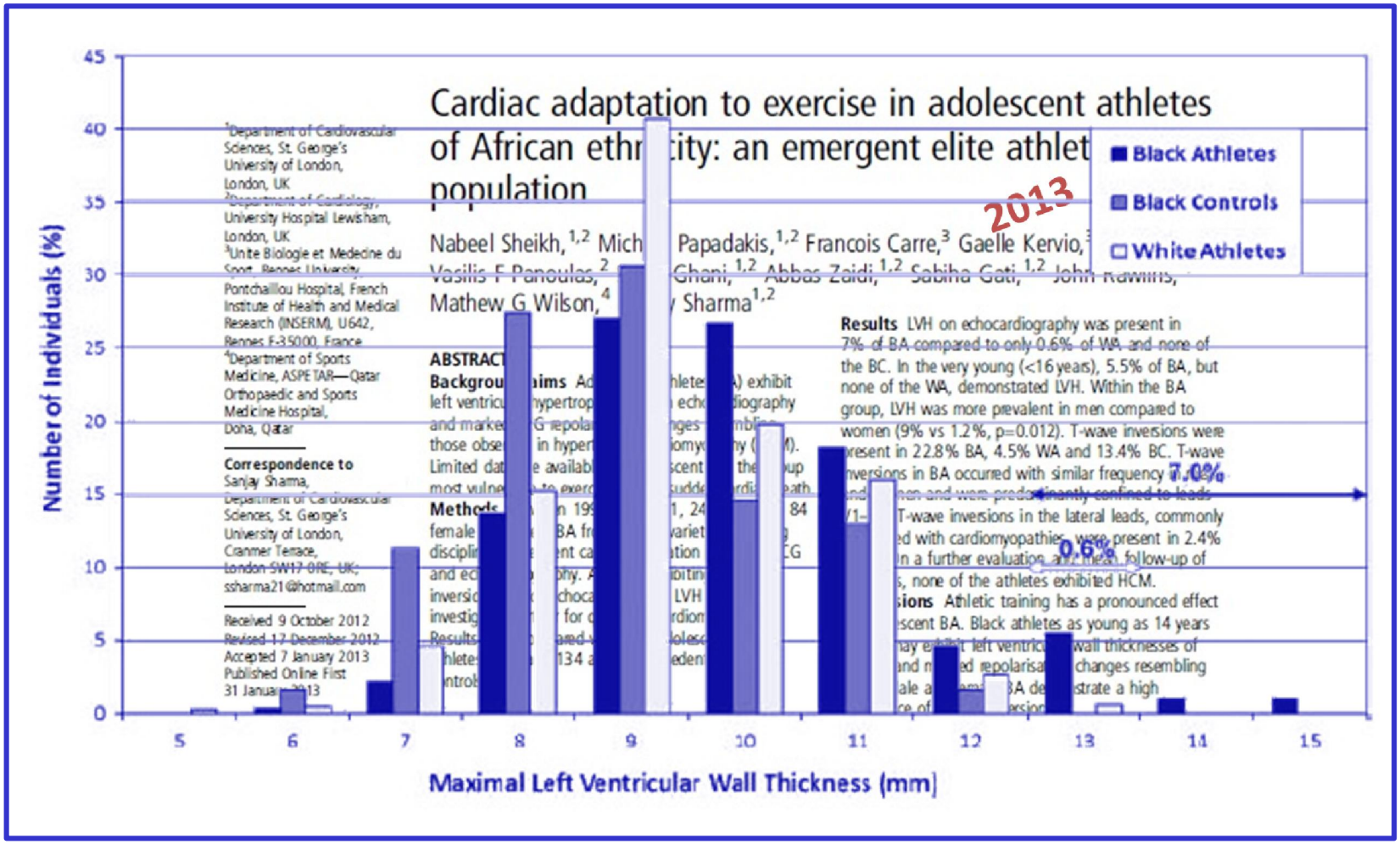
BAV elite athletes ($n = 16$)	*P*-value
Aortic diameter	
Aortic annulus (mm)	0.352
Sinuses of Valsalva (mm)	0.098
Sinotubular junction (mm)	0.075
Proximal ascending aorta (mm	0.018
Aortic annulus/BSA (mm/m^2)	0.462
Sinuses of Valsalva/BSA (mm/n	0.620
Sinotubular junction/BSA (mm	0.048
Proximal ascending aorta/BSA	0.174
Aortic valve regurgitation	
Absence	0.083
Mild	
Moderate	
Severe	



- **Las actividades deportivas en deportistas de élite con VAB no desencadenan un agrandamiento aórtico o disfunción de la válvula aórtica durante sus carreras deportivas.**

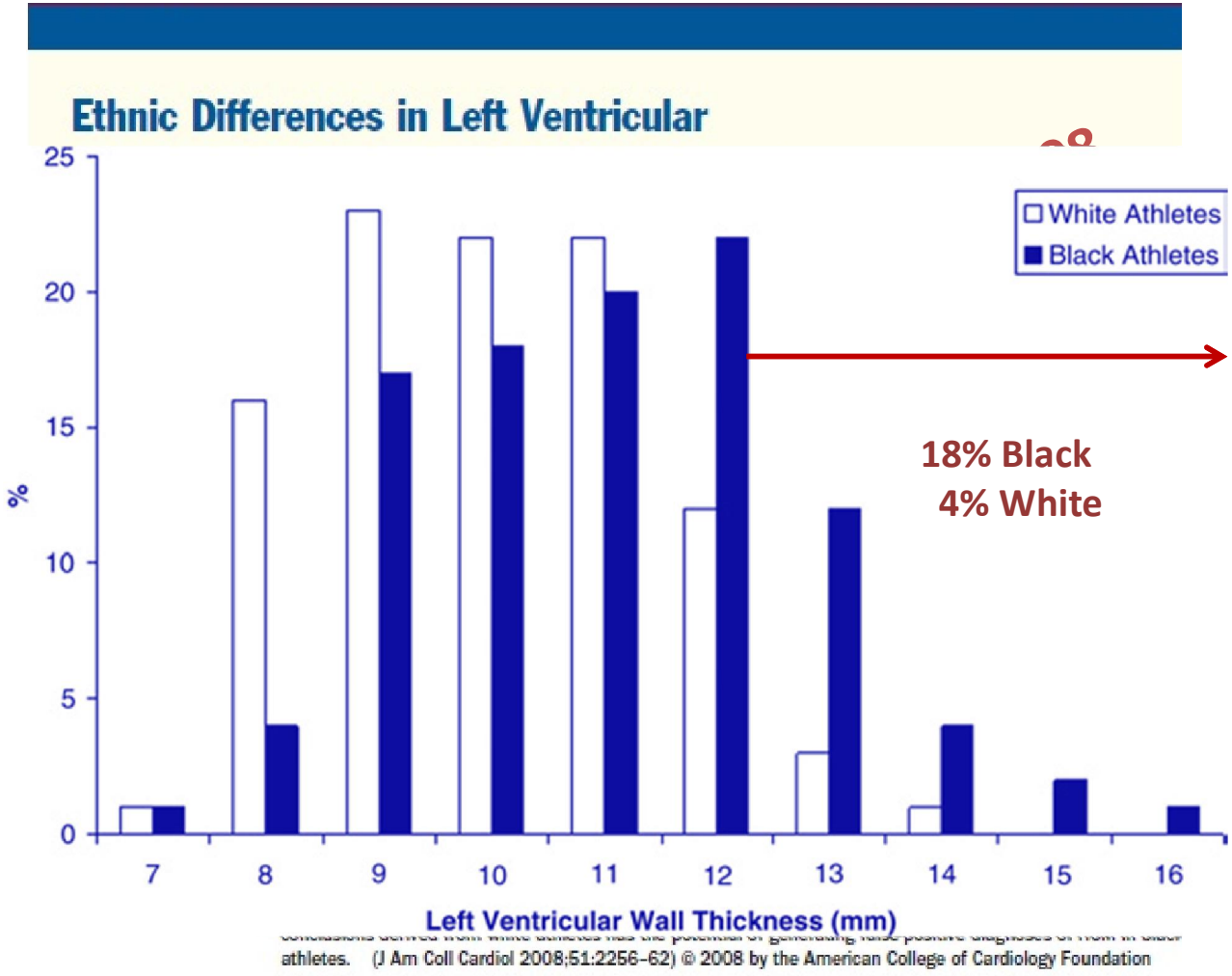
- **Los resultados de este estudio sugieren que el ejercicio cardiovascular de alta intensidad puede no ser perjudicial.**

- **La alta variabilidad interindividual a lo largo del curso clínico hace necesario un seguimiento ecocardiográfico cercano en deportistas competitivos.**



LVWT >12 mm 7% deportistas negros

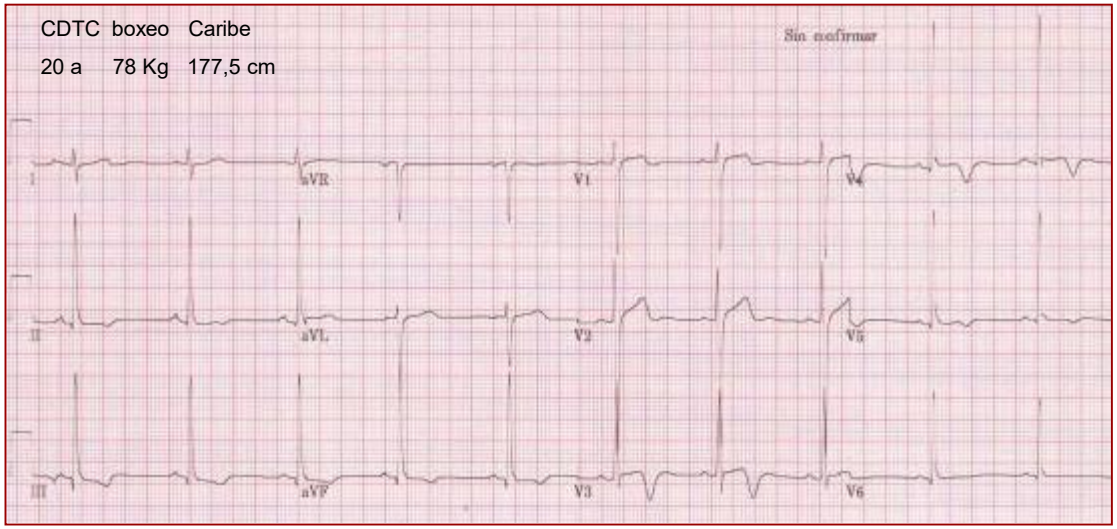
0.6% deportistas blancos



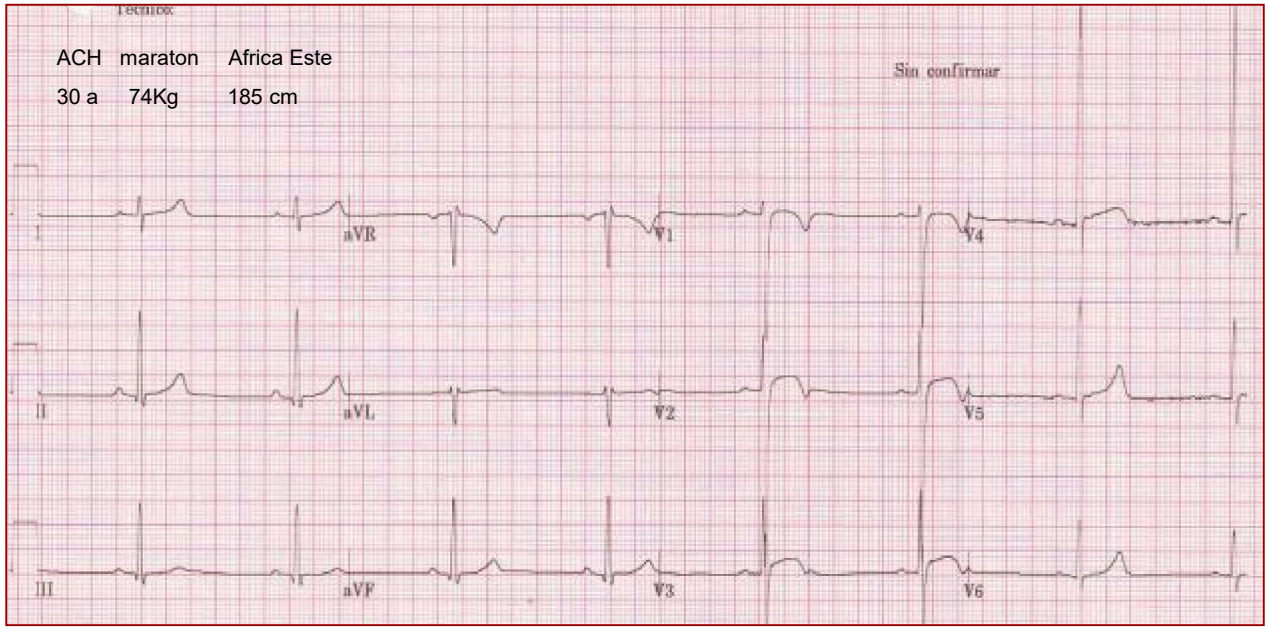
Basavarajaiah S. et al J Am Coll Cardiol 2008; 51:2256-62

	BLACK ATHLETES N=300	WHITE ATHLETES N=300	P-value
Age	20.5 ± 5.80 (14 - 35)	20.2 ± 4.9 (14 - 35)	NS
BSA	1.93 ± 0.2	1.89 ± 0.3	NS
LVWTd	11.3 ± 1.65 (8 – 16)	10.0 ± 1.5 (7 - 14)	<0.001
LVIDd	53 ± 4.4 (44 – 64)	53.6 ± 4.1 (42 - 66)	NS
LVM	286 ± 78 (113 - 618)	250 ± 62 (113 - 489)	< 0.001
LA	36 ± 4.2 (20 - 48)	35.8 ± 4.4 (24 - 47)	NS
E-wave (m/s)	0.87 ± 0.2 (0.5 – 1.5)	0.89 ± 0.3 (0.5 – 1.2)	NS
A-wave (m/s)	0.4 ± 0.2 (0.2 – 1)	0.5 ± 0.35 (0.3 – 0.9)	NS
E/A ratio	2.3 ± 0.9 (0.6 – 4.8)	2.2 ± 1 (0.7 – 3.6)	NS
FS	35.2 ± 6.8 (20 – 51)	36.3 ± 5.7 (24 – 42)	NS
ECG voltage criteria LVH	171 (57%)	93 (31%)	<0.001
ST segment elevation	258 (86%)	219 (73%)	<0.001
Negative T waves	33 (11%)	6 (2%)	<0.001

Basavarajaiah S. et al
J Am Coll Cardiol
2008; 51:2256-62



Deportistas negros



EJERCICIO INTENSO

> FE y de la FA secundario a aumento de la FC

- **Aumento de la actividad simpático-adrenal**
- **Aumento catecolaminas circulantes**

↓

Disrregulación de los beta-receptores

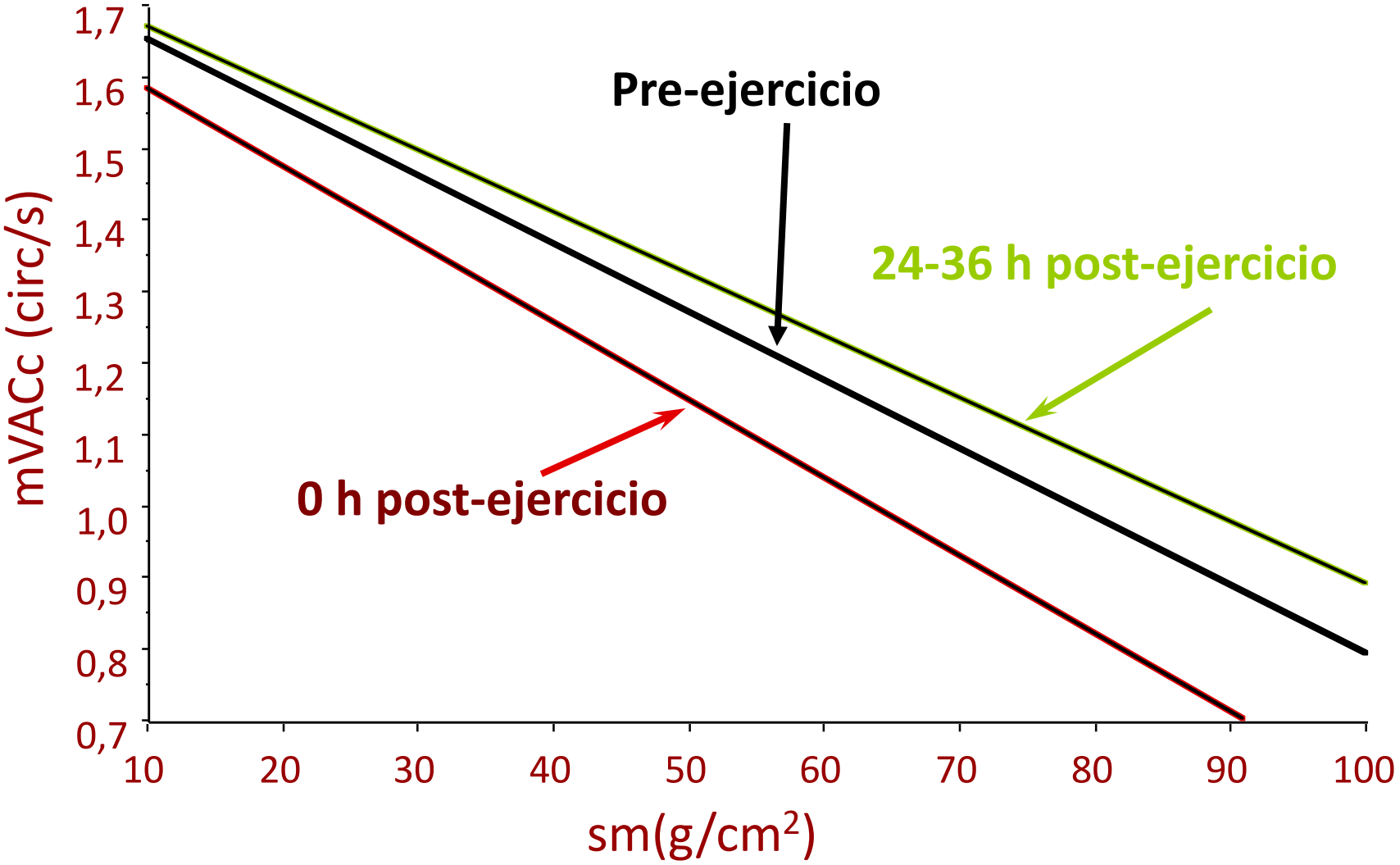
↓

descenso FE y de la FA

↓

FATIGA CARDIACA AGUDA

Función sistólica



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Exercis
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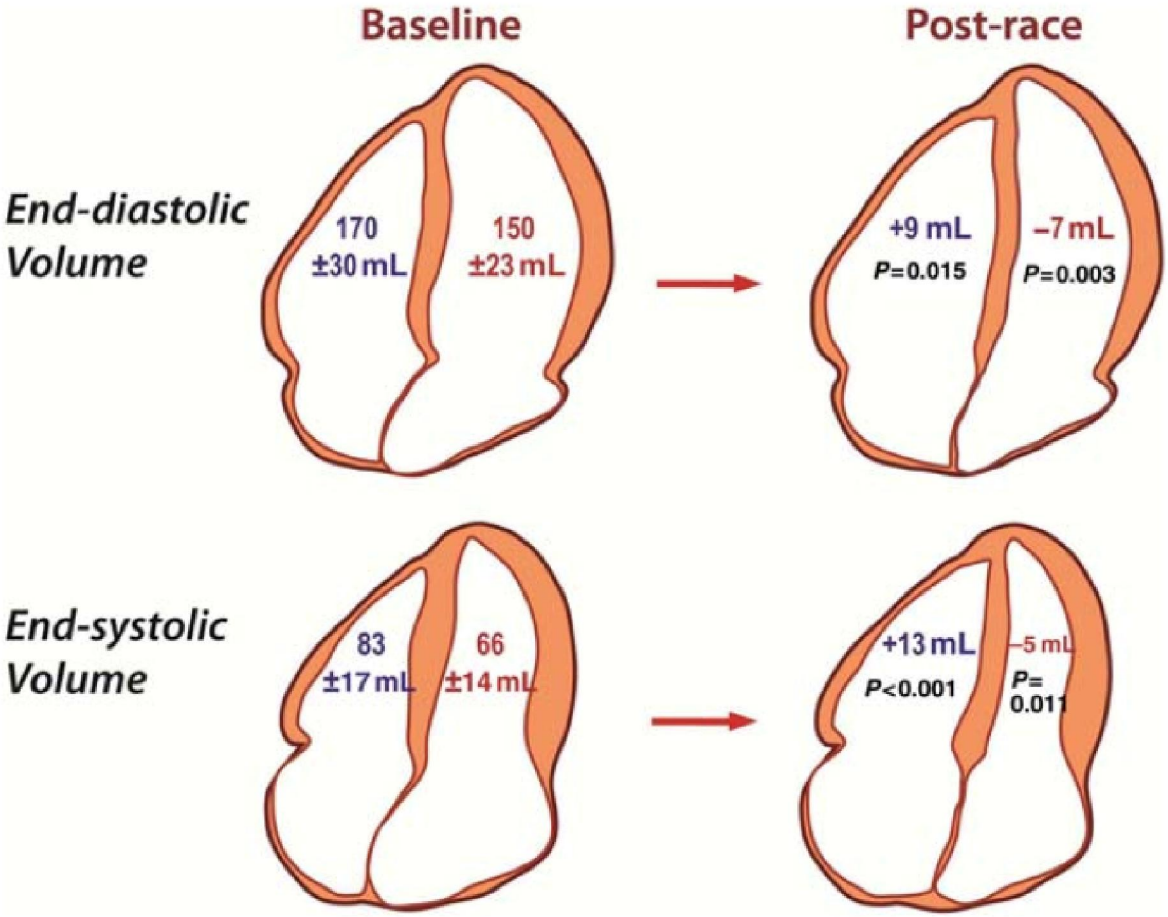
Received 25 March 2011;



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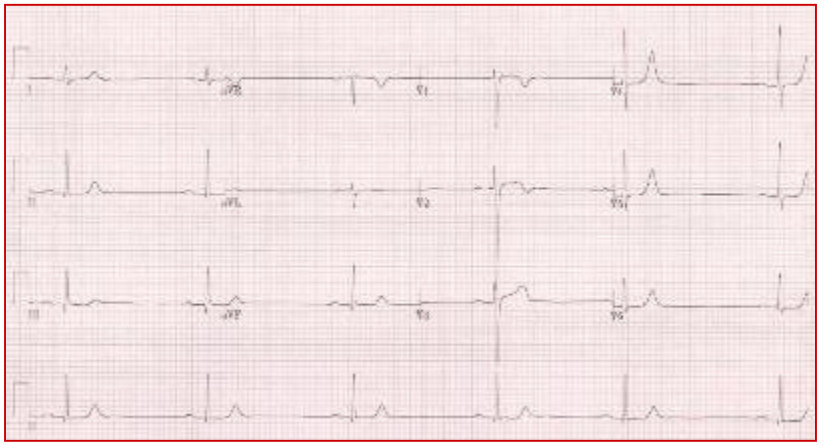
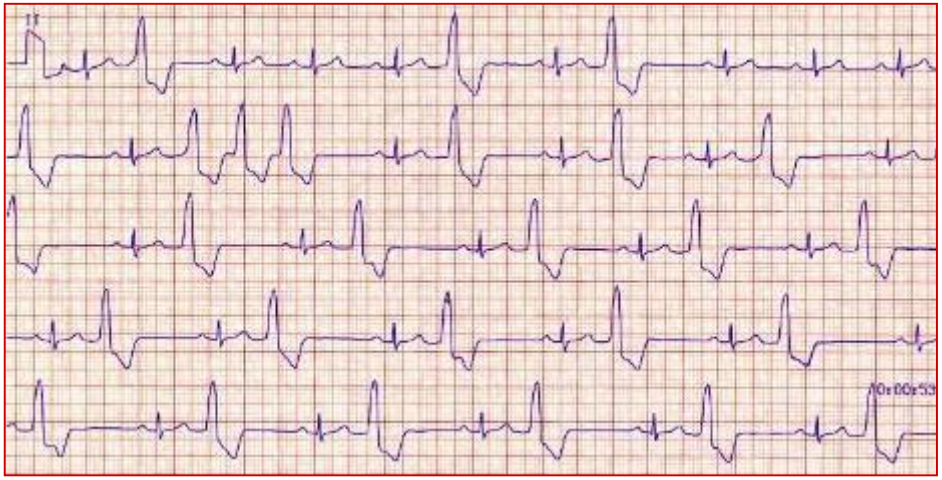
FATIGA CARDIACA SUBAGUDA/AGUDA

Hallazgos ECG:

- **Acentuación de la bradicardia**
- **Alteraciones de la repolarización**
- **Aumento EV en reposo y ejercicio**





Clinical Significance of Cardiac Damage and Changes in Function after Exercise

GREGORY P. WHYTE

Research Institute for Sp

WHYTE, G. P. Clin
No. 8, pp. 1416–142
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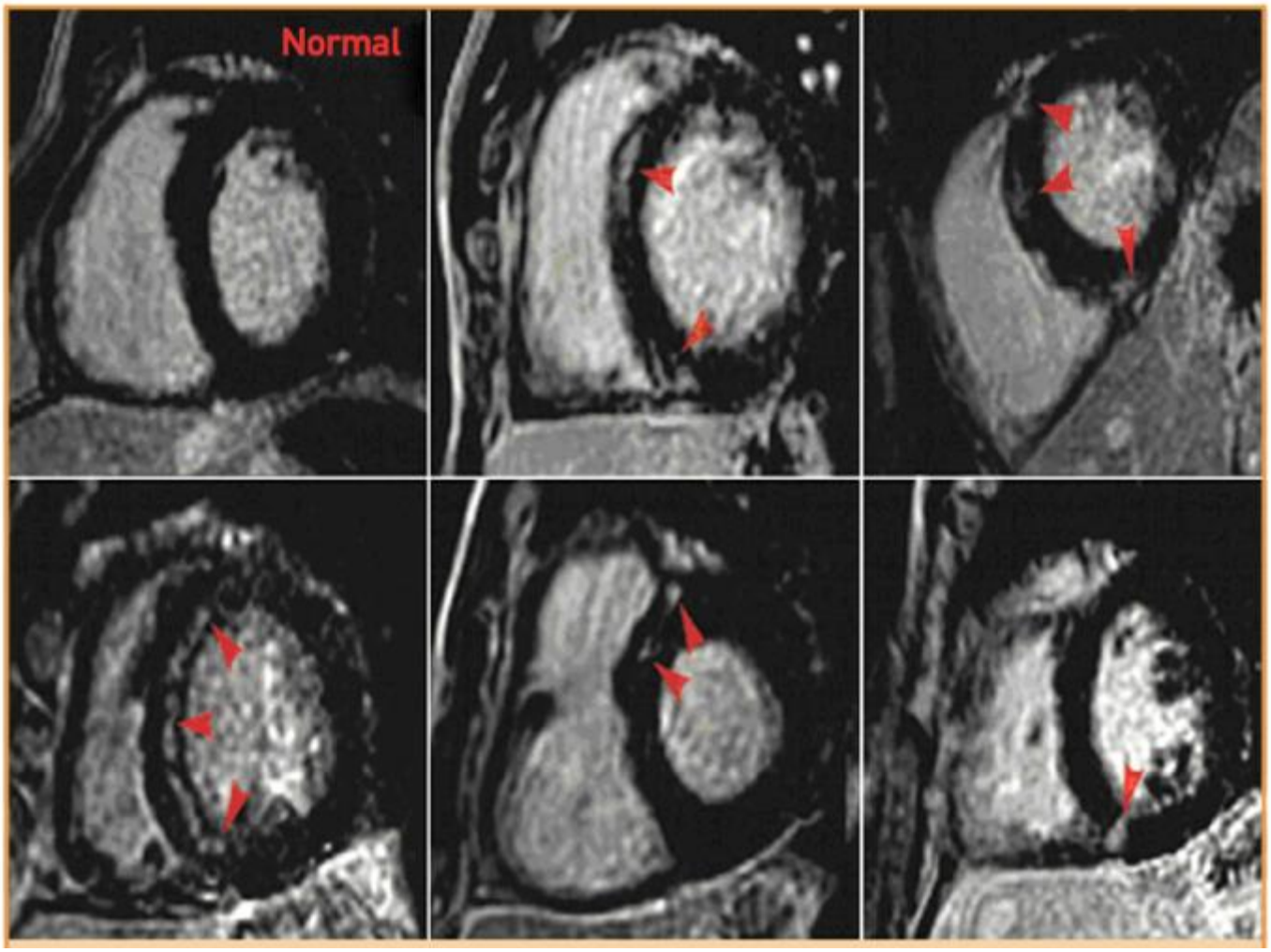

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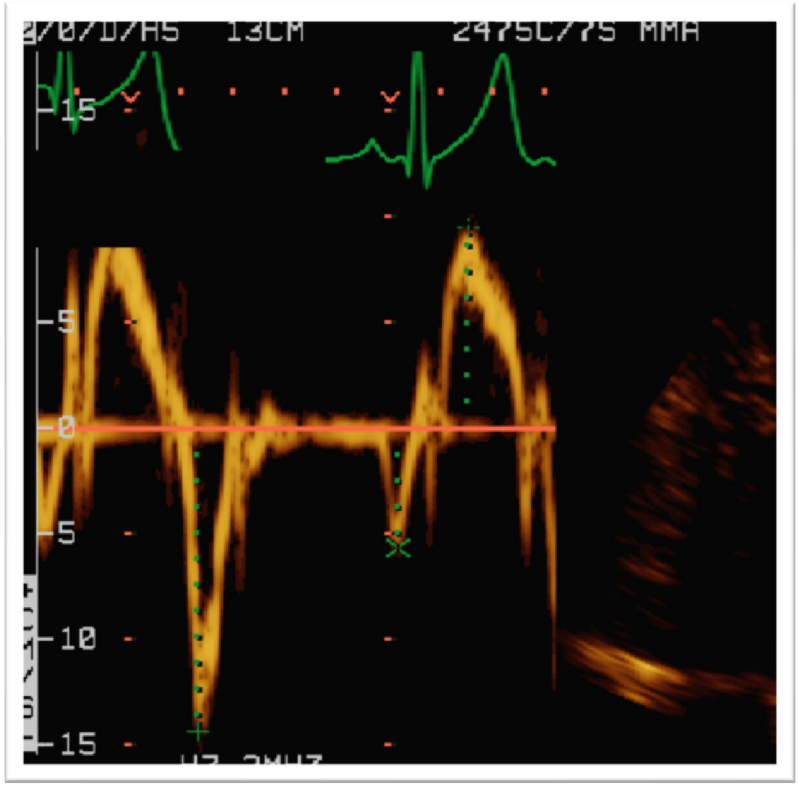
Arnau

La Gerche A. *Eur Heart J*. 2012;33(8):995-1006.

¿Dónde está el problema?

- **HVI limítrofe**
- **HVI segmentarias**
- **Ventrículos muy dilatados sin/con insuficiencias valvulares**
- **Ventrículos hipertrabeculados y con anomalías morfológicas**
- **Disfunción ventricular izquierda y derecha tanto sistólica como diastólica**

Deportistas altamente entrenados con excelente rendimiento deportivo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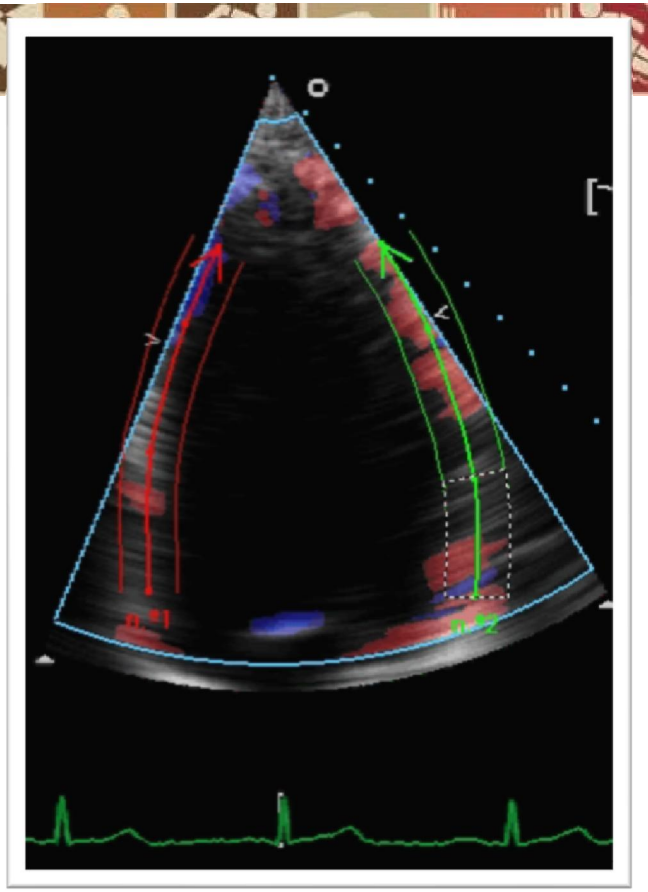
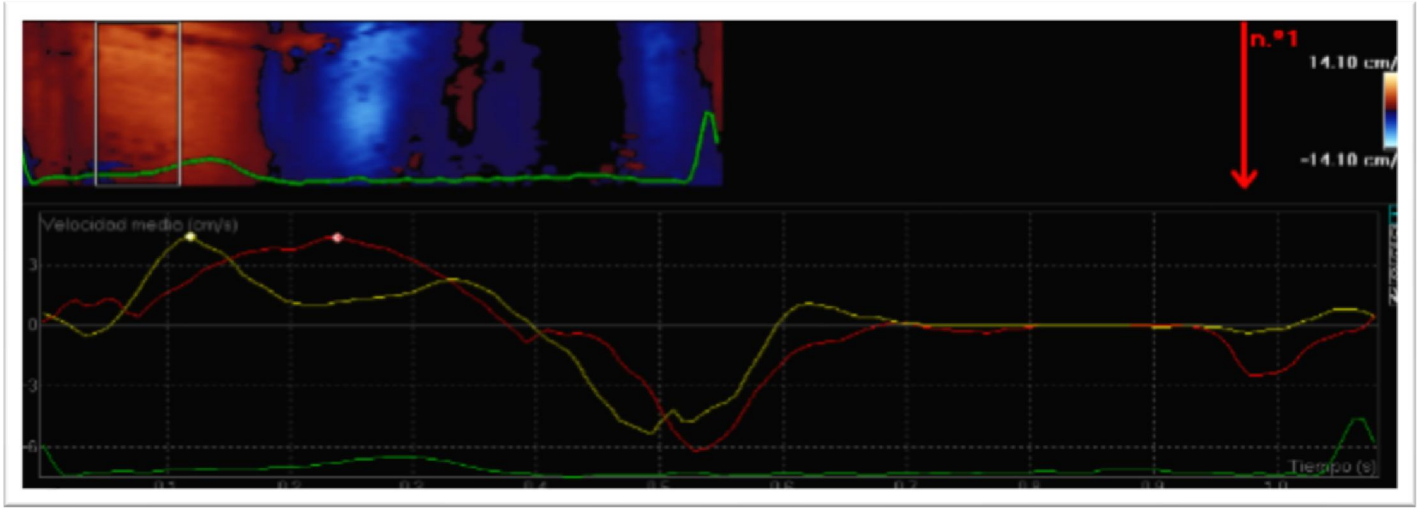
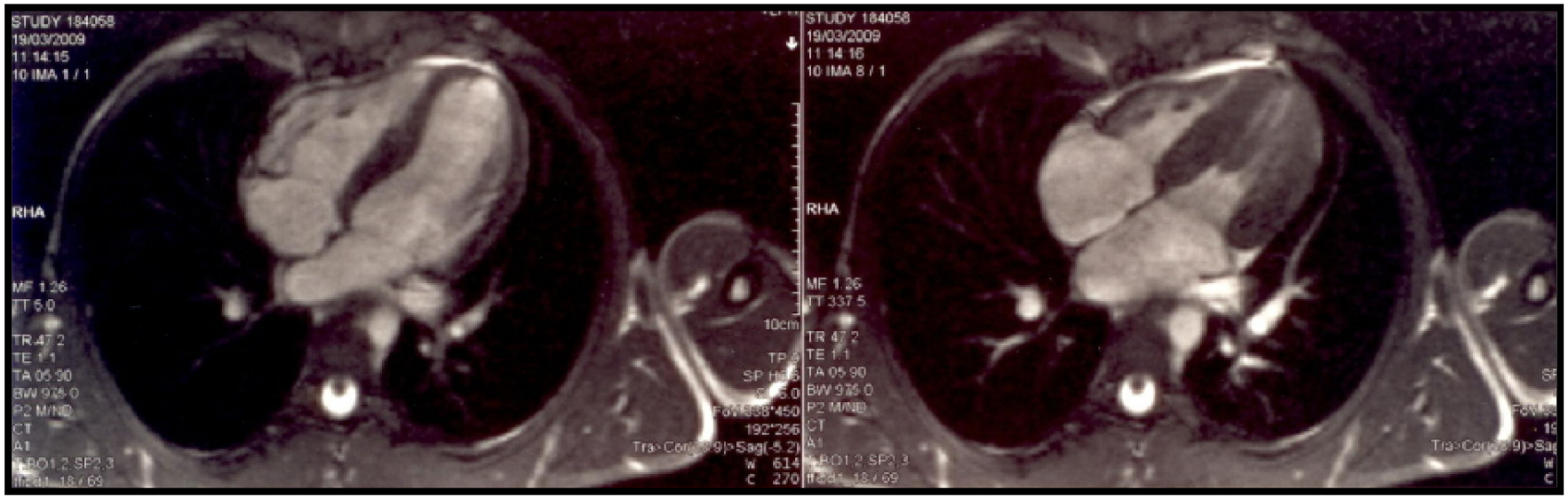
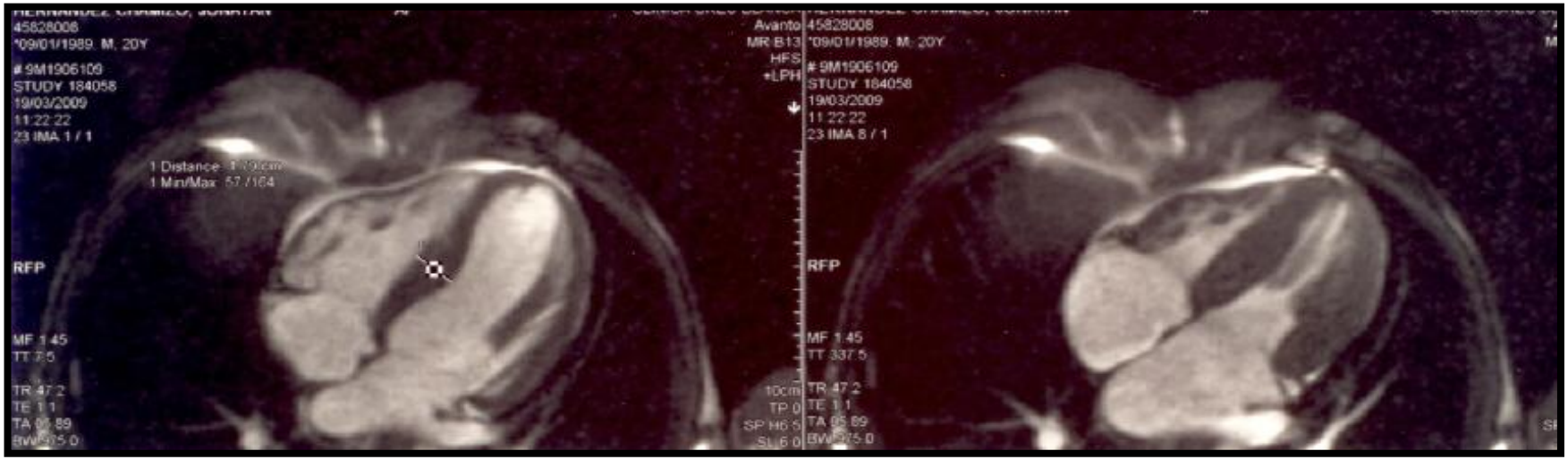



n.°1
14.10 cm/
-14.10 cm/
Velocidad media (cm/s)
Tiempo (s)


STUDY 184058
19/03/2009
11:14:15
10 IMA 1 / 1
RHA
MF 1.26
TT 5.0
TR 47.2
TE 1.1
TA 05:30
BW 925.0
P2 M/NB
CT
A1
SP2.3
STUDY 184058
19/03/2009
11:14:16
10 IMA 8 / 1
RHA
MF 1.26
TT 337.5
TR 47.2
TE 1.1
TA 05:30
BW 925.0
P2 M/NB
CT
A1
SP2.3


45828008
*09/01/1989, M, 20Y
#9M1906109
STUDY 184058
19/03/2009
11:22:22
23 IMA 1 / 1
1 Distance:
1 Min/Max 57 / 164
RFP
MF 1.45
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Avanto
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23 IMA 8 / 1
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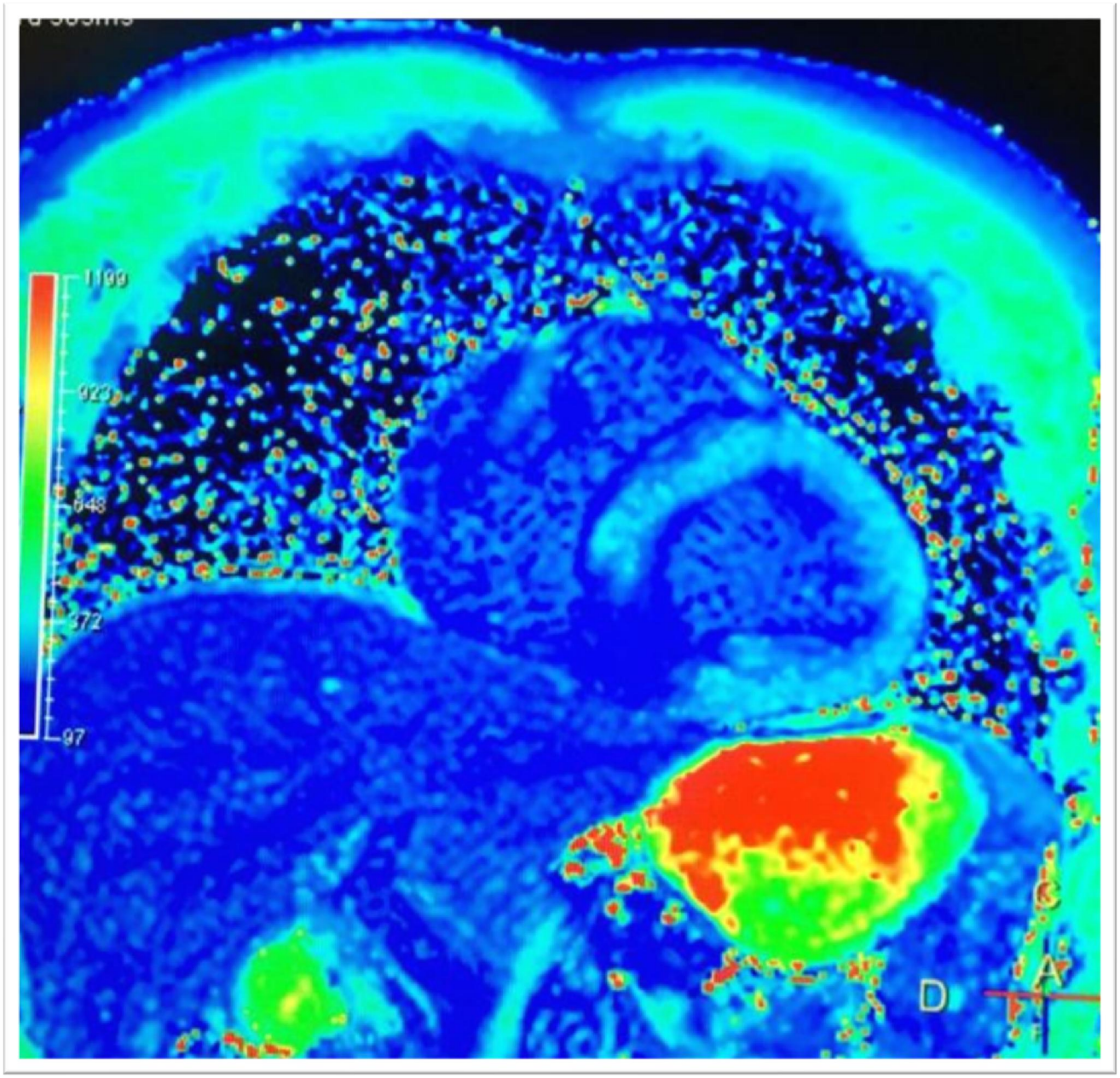
1199
923
648
372
97
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Ejercicio intenso

Zonas de mala perfusión miocardica

Isquemia → Necrosis → Fibrosis

sobrecarga VD y VI

Dilatación y atrofia fibroadiposa

Disfunción diastólica

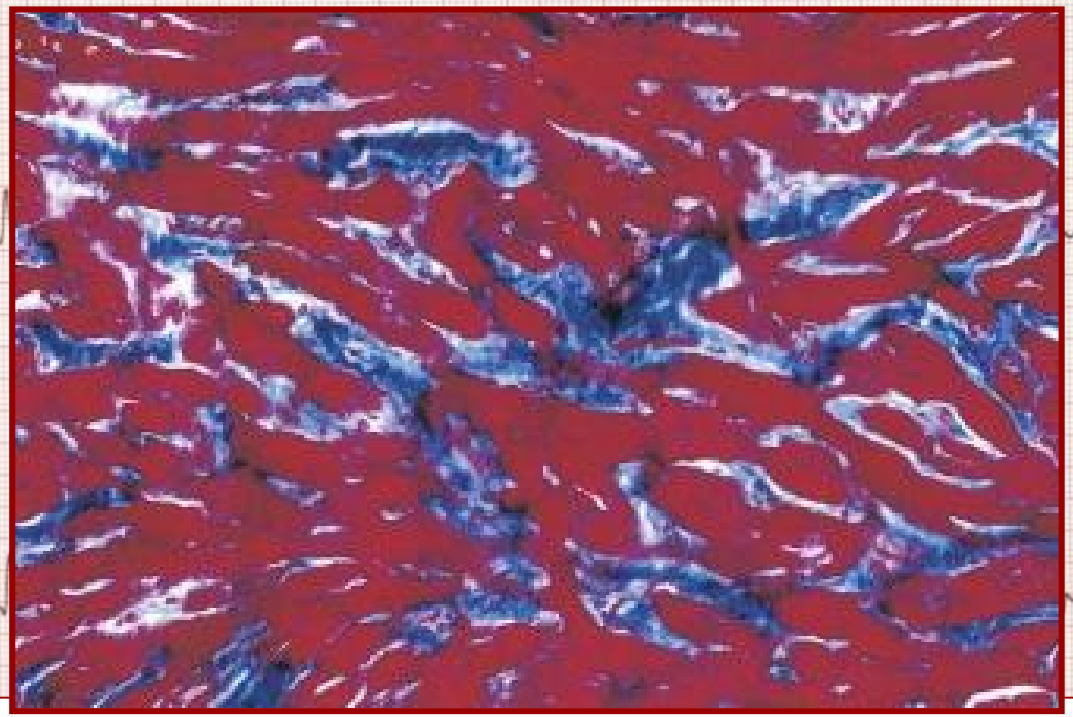
Disfunción sistólica

Inestabilidad eléctrica

Arritmias supraventriculares y ventriculares

Jugador de baloncesto, caucasiano de 23 años, asintomático

"Marcadas anormalidades en el ECG en deportistas jóvenes pueden representar la expresión inicial de miocardiopatías subyacentes"



Lower than expected desmosomal gene mutation prevalence in endurance athletes with complex ventricular arrhythmias of right ventricular origin

A La Gerche,[1,3] C Robberecht,[2] C Kuiperi,[2] D Nuyens,[1] R Willems,[1] T de Ravel,[2] G Matthijs,[2] H Heidbüchel[1,3]

Heart 2010;**96**:1268–1274.

- **47 deportistas de resistencia sintomáticos**
- **41 (87%) con arritmias ventriculares derechas complejas y criterios de MCA**
- **10 mutaciones heterocigóticas en 5 genes desmosómicos pero sólo en 6 fueron considerados como patogénicos (13%)**

Genética y deporte

Recientes estudios en deportistas de competición encuentran mutaciones en genes asociados con MCH y MCA

Entrenamiento intenso

Altera o modifica polimorfismos

?

¿Estas mutaciones mejoran el rendimiento?

CONCLUSIONES

- **En deportistas adultos caucasianos el limite superior del grosor parietal del VI 12 mm para hombres y 10 mm para mujeres. En deportistas negros es 14 mm para hombres y 12 mm para mujeres.**

- **20% de los hombres y 17% de las mujeres deportistas de elite caucasianas están sobre el limite fisiológico de la dimensión del VI. El limite superior es 63 mm en hombres y 56 mm en mujeres.**

- **16% de los hombres y 8% de las mujeres muestran HVI ligera.**

- **Las dimensiones de la raíz de la aorta, tanto absolutos como corregidos por SC, se encuentran dentro del rango de la normalidad.**

CONCLUSIONES

- **Las mayores adaptaciones se observan en deportes con alto componente dinámico y estático.**

- **En los deportistas en la zona gris el control evolutivo y un abordaje multidisciplinar son requeridos teniendo en cuenta la edad, deporte y nivel de dedicación.**

- **Las bradiarritmias extremas y de arritmias ventriculares pueden reflejar sobreentrenamiento**

- **La aparición de disfunción diastólica debe hacer pensar en fatiga cardiaca**

- **Es preciso conocer estas alteraciones para no confundir adaptación con patología**