

PLACE

PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

ROMA

Centro Congressi
di Confindustria

**Auditorium
della Tecnica**

9ª Edizione

30 Settembre

1 Ottobre

2022



PREVENIRE LA MORTE IMPROVVISA

I BASSI VOLTAGGI DEL QRS NEGLI SPORTIVI: QUALI IMPLICAZIONI CLINICHE?

Dott. Tatangelo Mario

Istituto di Medicina e Scienza dello Sport

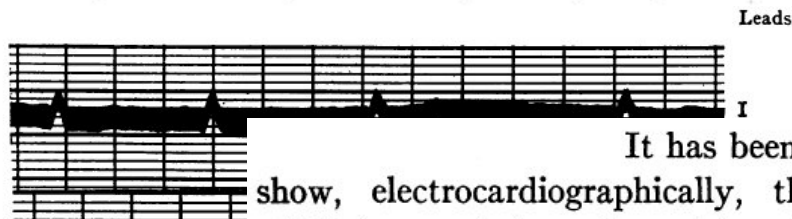


THE SIGNIFICANCE OF ELECTROCARDIOGRAMS OF LOW VOLTAGE¹

By HOWARD B. SPRAGUE AND PAUL D. WHITE

(From the Cardiac Clinic and Laboratory of the Massachusetts General Hospital)

(Received for publication June 18, 1926)



It has been found that there are patients who show, electrocardiographically, the condition of "low voltage," e QRS. deflections from the base line S.

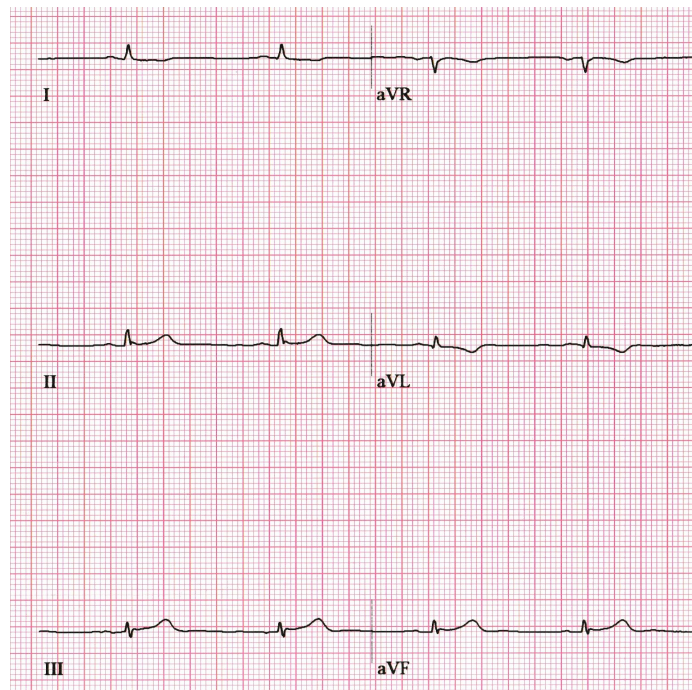
7. Excluding the temporary effect in hypothyroidism low voltage has never been found, in our experience, in records from normal hearts. It is a finding of diagnostic and prognostic importance in forming an opinion of the myocardial ability of any individual.





Definizione

- L'ampiezza del QRS dal picco al nadir < 5 mm nelle derivazioni periferiche, o
- La somma delle ampiezze del QRS delle derivazioni periferiche < 30 mm
- L'ampiezza del QRS dal picco al nadir < 10 mm nelle derivazioni precordiali





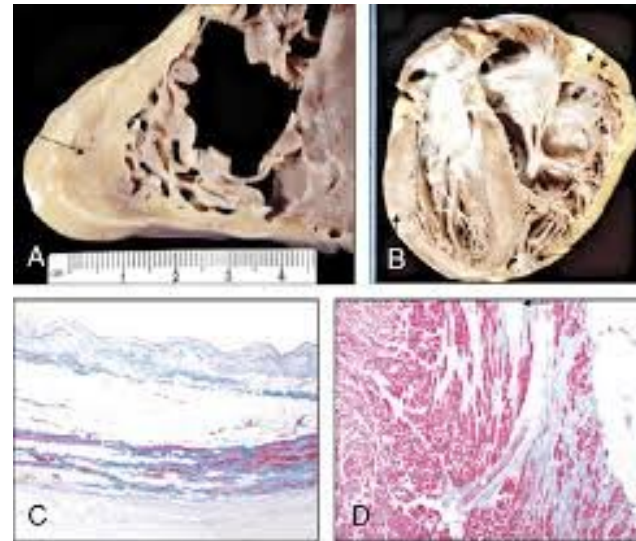
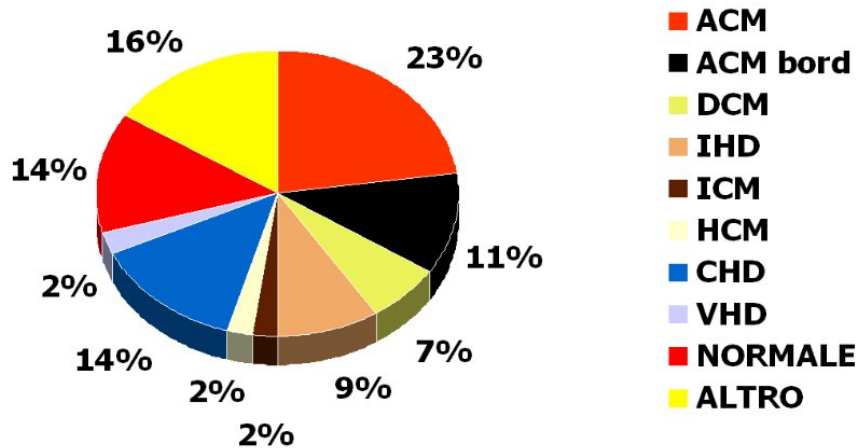
**Low Voltage
ECG**



Cardiomiopatia aritmogena

La **Cardiomiopatia Aritmogena**, caratterizzata dalla **progressiva perdita del tessuto miocardico** e dalla sua **sostituzione con tessuto fibro-adiposo**, è una delle principali cause di arresto cardiaco nei giovani e negli atleti

Casistica Regione LAZIO Sett 2000-Aprile 2003 (n=61)

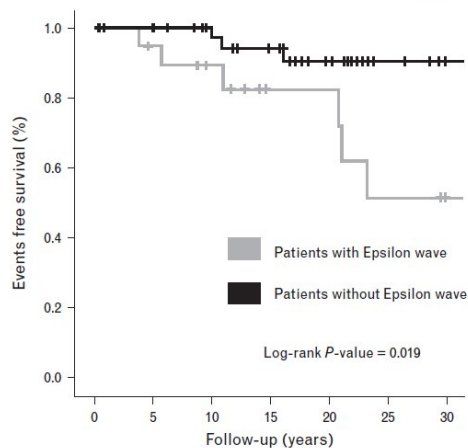




Arrhythmogenic right ventricular cardiomyopathy: ECG progression over time and correlation with long-term follow-up

Cristina Gallo^a, Alessandro Blandino^b, Carla Giustetto^a, Matteo Anselmino^a, Davide Castagno^a, Elena Richiardi^c and Fiorenzo Gaita^a

Electroprognosis: correlation between ECG parameters and long-term follow-up (P < 0.05).



Event-free survival from composite endpoint stratified for the presence of Epsilon wave. Patients with Epsilon wave have higher risk of composite endpoint occurrence during long-term follow-up (log-rank P -value = 0.019).

relation with
 2. Mean time is 10 ± 7 (range registered at the first ECG) (P = 0.001), Epsilon wave is V4-V5-V6 respectively) and progression over

Table 3 Association between electrocardiographic parameters with the long-term occurrence of the composite endpoint

ECG features	Composite endpoint (univariate analysis)		
	-	+	P
Sinus rhythm	96%	100%	0.845
Heart rate (bpm)	64	58	0.325
Negative or diphasic P wave in lead II	12%	50%	0.209
P voltage lead II (mm)	1.2	1.1	0.625
P duration lead II (s)	0.10	0.09	0.222
Negative or biphasic P wave in lead V1	39%	30%	0.624
P voltage lead V1 (mm)	0.89	0.81	0.800
P duration V1 (s)	0.06	0.07	0.973
PQ interval (s)	0.181	0.210	0.076
QRS electrical axis: $<0^\circ$ or $>110^\circ$	19%	20%	0.816
QRS duration in lead V1 (s)	0.10	0.12	0.137
QRS duration in lead V6 (s)	0.08	0.09	0.101
R/S ratio	0.50	0.40	0.786
QRS ≥ 110 ms in V1-V2	73%	80%	0.280
QRS duration (V1 + V2 + V3)/(V4 + V5 + V6)	1.2	1.3	0.706
R wave voltage in V1 (mm)	1.5	1.1	0.397
R wave voltage in V2 (mm)	4.1	4.2	0.961
R wave voltage in V3 (mm)	4.9	2.6	0.211
Epsilon wave	24%	60%	0.016
QRS dispersion >40 ms	49%	40%	0.541
Left anterior fascicular block	7.4%	20%	0.201
Right bundle branch block	13%	20%	0.371
S wave upstroke >55 ms	53%	60%	0.164
Negative T wave in V1	79%	100%	0.329
Negative T wave in V2	57%	80%	0.184
Negative T wave in V3	48%	60%	0.583
Negative T wave in V4	28%	40%	0.405
Negative T wave in V5	17%	33%	0.498
Negative T wave in V6	12%	10%	0.586
QRS voltage in each limb lead ≤ 0.5 mV	25%	20%	0.750



Relationship Between Electrocardiographic Findings and Cardiac Magnetic Resonance Phenotypes in Arrhythmogenic Cardiomyopathy

Manuel De Lazzari, MD, PhD; Alessandro Zorzi, MD, PhD; Alberto Cipriani, MD; Angela Susana, MD; Giulio Mastella, MD; Alessandro Rizzo, MD; Ilaria Rigato, MD, PhD; Barbara Bauce, MD, PhD; Benedetta Giorgi, MD; Carmelo Lacognata, MD; Sabino Iliceto, MD; Domenico Corrado, MD, PhD; Martina Perazzolo Marra, MD, PhD

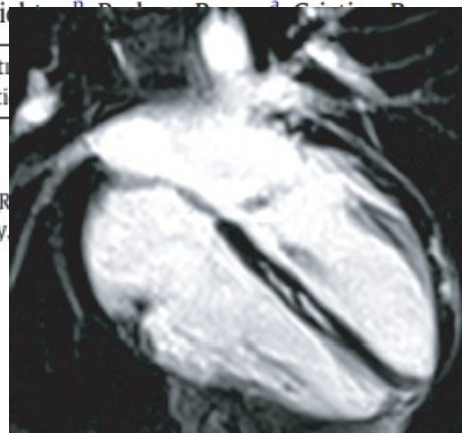
Table 5. Relationship between ECG findings and diagnosis of arrhythmogenic cardiomyopathy: The Padua criteria (<0.5 mV) in Limb Leads

Parameters
RV EDV, mL/m ²

Domenico Corrado ^{a,*}, Martina Perazzolo Marra ^a, Alessandro Zorzi ^a, Giorgia Beffagna ^a, Alberto Cipriani ^a, Manuel De Lazzari ^a, Federico Migliore ^a, Kalliopi Pilichou ^a, Alessandra Rampazzo ^b, Ilaria Rigato ^a, Stefania Rizzo ^a, Gaetano Thiene ^a, Aris Anastasakis ^c, Angeliki Asimaki ^d, Chiara Bucciarelli-Ducci ^e, Kristine H. Haugaa ^f, Francis E. Marchlinski ^g, Andrea Mazzanti ^h, William J. McKenna ⁱ, Antonis Pantazis ^j, Antonio Pelliccia ^k, Christian Schmied ^l, Sanjay Sharma ^m, Thomas Wichterle ⁿ, Peter B. Bieganski ^o, Giovanni Basso ^p



Category	Right ventricle (upgraded 2010 ITF diagnostic criteria)	Left ventricle (diagnostic criteria)
RV ICGF	1/13 (69%)	1/12 (75%)
IV. Depolarization abnormalities	<p>Minor</p> <ul style="list-style-type: none"> Epsilon wave (reproducible low-amplitude signals between end of QRS complex to onset of the T wave) in the right precordial leads (V1 to V3) Terminal activation duration of QRS ≥ 55 ms measured from the nadir of the S wave to the end of the QRS, including R', in V1, V2, or V3 (in the absence of complete RBBB) 	<p>Minor</p> <ul style="list-style-type: none"> Low QR obesity



ids
ons²⁵⁻²⁷ by
f low QRS
ext of ACM
ity did not

(in the absence of



Risk of Mortality in Individuals With Low QRS Voltage and Free of Cardiovascular Disease

Andrew O. Usoro, BS^a, Natalie Bradford, MD^b, Amit J. Shah, MD^c,
and Elsayed Z. Soliman, MD, MSc, MS^{b,d,*}

Table 2

Low QRS voltage (LQRSV) and risk of all-cause mortality

	n	Event Rate/1,000 Person years	Model 1 [*] Demographic Model		Model 2 [†] Demographics and CVD Risk Factors Model		Model 3 [‡] Demographics, CVD Risk Factors, ECG Abnormalities, and Noncardiac Disease Model	
			HR (95% CI)	p Value	HR (95% CI)	p Value	HR (95% CI)	p Value
LQRSV-absent	89	23.5	Reference	—	Reference	—	Reference	—
LQRSV-present	6,355	51.1	1.63 (1.21, 2.18)	<0.01	1.68 (1.26, 2.25)	<0.01	1.61 (1.20, 2.16)	<0.01

CI = confidence interval; HR = hazard ratio.

^{*} Adjusted for age, sex, and race.

[†] Adjusted for variables in model 1 variables plus body mass index, smoking status, systolic blood pressure, blood pressure medications, hyperlipidemia, and diabetes mellitus.

[‡] Adjusted for variables in model 2 plus ECG abnormalities, cancer, and pulmonary disease (bronchial asthma and chronic obstructive airway disease).



INQUADRAMENTO DEI BASSI VOLTAGGI ALL'ECG NELLO SCREENING MEDICO SPORTIVO



Low QRS voltages in Olympic athletes: Prevalence and clinical correlates

Federica Mango¹, Stefano Caselli^{1,2}, Andreas Luchetti¹ and Antonio Pelliccia¹

European Journal of Preventive Cardiology
0(0) 1-7
© The European Society of Cardiology 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2047487320914758
journals.sagepub.com/home/cpr
SAGE



Table 3. Cardiac dimensional and functional parameters in athletes according to the limb voltages.

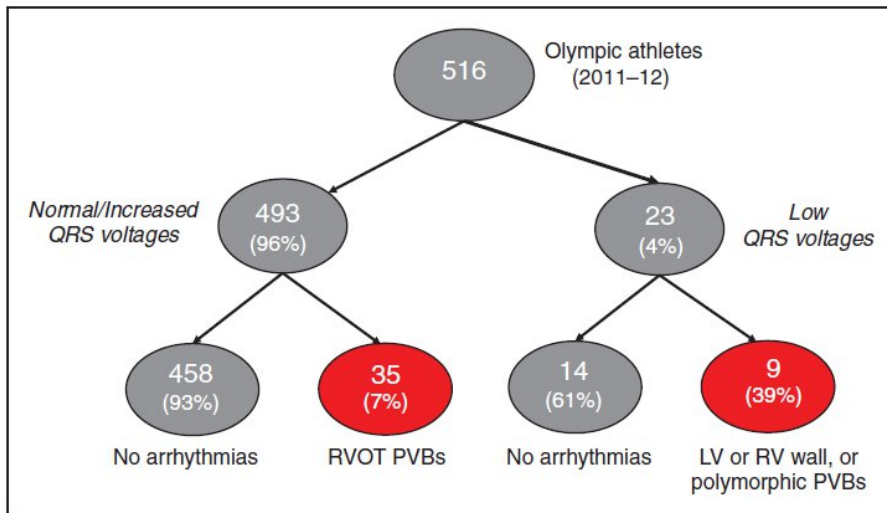


Figure 1. Flow-diagram of the study design and result, showing prevalence of premature ventricular beats (PVBs) in athletes with low QRS voltages (LQRSVs) vs normal/increased voltages.

LV: left ventricular; RV: right ventricular; RVOT: right ventricular outflow tract origin.

Low voltages (n = 23)	p Value
9.4 ± 1.3	0.382
9.0 ± 1.3	0.270
52 ± 5	0.429
94 ± 21	0.108
0.35 ± 0.02	0.375
65 ± 7	0.357
36 ± 4	0.442
31 ± 4	0.558
85 ± 13	0.572
48 ± 9	0.516
1.81 ± 0.38	0.281
192 ± 46	0.281
82 ± 10	0.804
13 ± 2	0.440
6.4 ± 1.1	0.821
25 ± 3	0.103

• Skill: 26%

516 Olympic athletes

Prevalence and clinical significance of isolated low QRS voltages in young athletes



ESC
European Society
of Cardiology

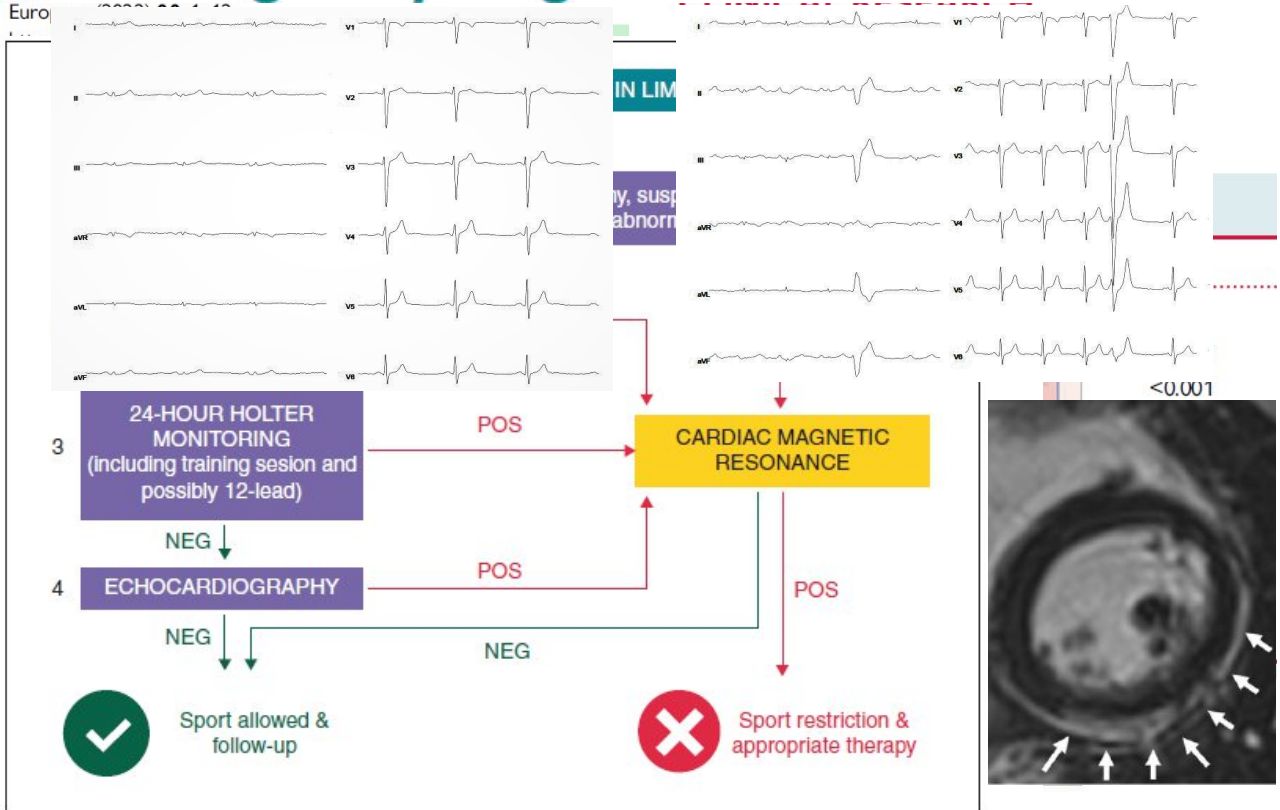
Prevalen

KEY QUESTIONS

- 1) What is the prevalence of low QRS-voltages in limb leads (LQRSV) in isolation on the electrocardiogram of athletes?
- 2) What is their clinical meaning?

Bellevue, WA, USA; and ⁹Center

Received 12 November 2021; edit





Take-Home Message

- I **Bassi voltaggi** nelle derivazioni periferiche sono un reperto **non-infrequente** ed **inaspettato** negli atleti.
- Dovrebbero rappresentare una «**red flag**» nell'interpretazione dell'ECG negli atleti
- Se associati a una storia personale o familiare positiva o ad altre anomalie , dovrebbero essere richiesti **ulteriori accertamenti**.



