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CARDIOVASCULAR REHABILITATION IN PATIENTS WITH CARDIAC RESYNCHRONIZATION THERAPY (CRT-D)

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BACKGROUND

- Patients with a CRT-D devices represent an emerging population of subjects with chronic heart failure (CHF) who, according the current guidelines, must be referred to a cardiovascular rehabilitation (CR) program

Eur J Heart Fail 2011;13(4):347-357

Recommendations for exercise prescription and multidisciplinary management

Recommendations	Class[a]	Level[b]	Ref[c]
It is recommended that regular aerobic exercise is encouraged in patients with heart failure to improve functional capacity and symptoms.	I	A	262,263
It is recommended that patients with heart failure are enrolled in a multidisciplinary-care management programme to reduce the risk of heart failure hospitalization.	I	A	236, 259, 264

[a]Class of recommendation.
[b]Level of evidence.

European Heart Journal (2012) 33, 1787–1847
doi:10.1093/eurheartj/ehs104

ESC GUIDELINES

ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012

2013 ACCF/AHA Guideline for the Management of Heart Failure

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American College of Chest Physicians, Heart Rhythm Society and International Society for Heart and Lung Transplantation

Endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation

7.3.1.6. Activity, Exercise Prescription, and Cardiac Rehabilitation: Recommendations

Class I

1. **Exercise training (or regular physical activity) is recommended as safe and effective for patients with HF who are able to participate to improve functional status.**[404–407] ***(Level of Evidence: A)***

Class IIa

1. **Cardiac rehabilitation can be useful in clinically stable patients with HF to improve functional capacity, exercise duration, HRQOL, and mortality.**[404,406–411] ***(Level of Evidence: B)***

BACKGROUND

Exercise training in patients with mild-to-moderate CHF:

- improves exercise capacity (peak oxygen uptake +15-30%)
- improves quality of life
- does not adversely affect left ventricular remodelling
- may reduce mortality and hospitalization

Recommendation class I

Eur J Heart Fail 2011;13(4):347-357
JAMA 2009; 301,14

BACKGROUND

- Cardiac resynchronization therapy aims at diminishing cardiac dissynchrony in patients with heart failure
- The effect of cardiac resynchronization therapy can be improved by optimization of device programming
- Currently optimization of device programming is mainly performed only during resting condition

J Cardiovasc Electrophysiol, Vol 21, pp 1307-13-16

AIMS

The **aims** of the study were:

- to evaluate in CRT-D recipients the safety and efficacy of a physical exercise program, in a outpatient CR setting
- to evaluate the need for an individual optimization of device programming, in order to obtain an adequate increase in heart rate and to maintain resynchronization therapy during exercise.

CRT-D recipients underwent clinical and functional investigatio
comprehensive of **symptom-limited cardiopulmonary exercise
testing** (exercise test protocol 10Wx1), during which device
programming were evaluated.

METHODS

-All patients were receiving optimal medical therapy for CHF and had been in a stable condition for more than 1 month

-They underwent a program of physician-supervised 60 min session of exercise training (endurance and resistance), 3 sessions/week; 18 sessions

POPULATIONS

- We enrolled in the study 17 consecutive white adult CHF patients, in NYHA functional class II or III, recently implanted with a CRT-D devices for primary prevention

Baseline patients characteristics	
Male sex	77%
Age	71±9
Non-ischaemic cardiomyopathy	85%
Ejection fraction	37±6 %
Atrial fibrillation	15%
Peak oxygen uptake	14±8 ml/kg/min
Peak cardiac power output	89±27 Watt

RESULTS (1)

SAFETY

- No adverse events
- No changes in sensing, pacing and impedance parameters
- No patients experienced shock during supervised exercise training

- The use of heart rate monitors during training did not induce any electromagnetic interference with the CRT devices

RESULTS (2)

EFFICACY (evaluated with cardiopulmonary exercise testing before and after CR)

	Before CR	After CR
Exercise duration	8,5±2,7	9,3±3,2
Peak oxygen uptake (ml/kg/min)	16,8±3,6	20±5,5
Peak cardiac power output (Watt)	95,6±25,9	104,4±31,4

P<0,05

RESULTS (3)

OPTIMIZATION OF DEVICE PROGRAMMING

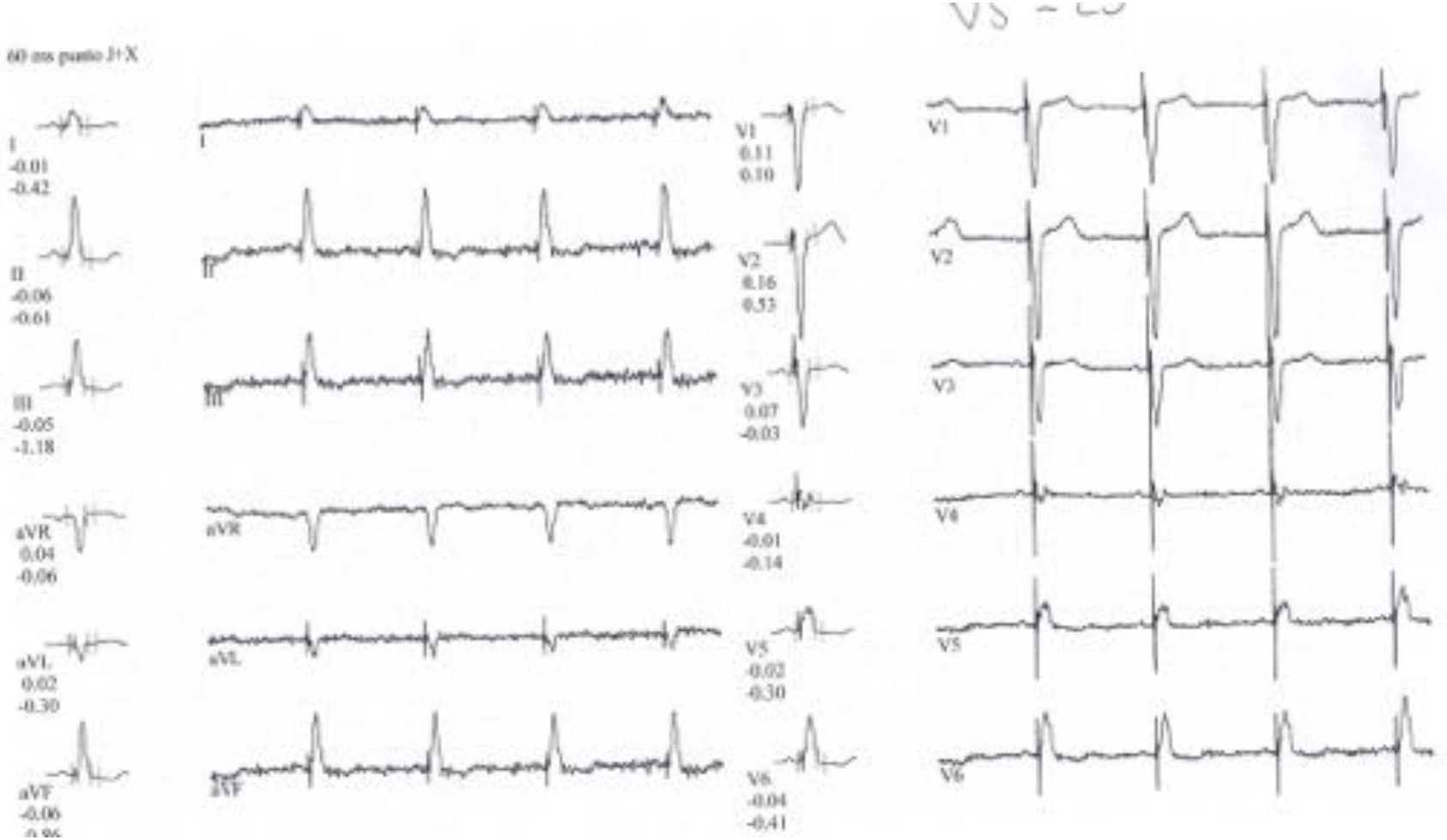
"Brady" functions reprogramming: 6 patients (46%)

- optimization of rate-responsive function (4 cases)
- increase of upper rate (2 cases)
- optimization of atrio-ventricular delay (1 case)
- optimization of inter-ventricular delay (1 case)

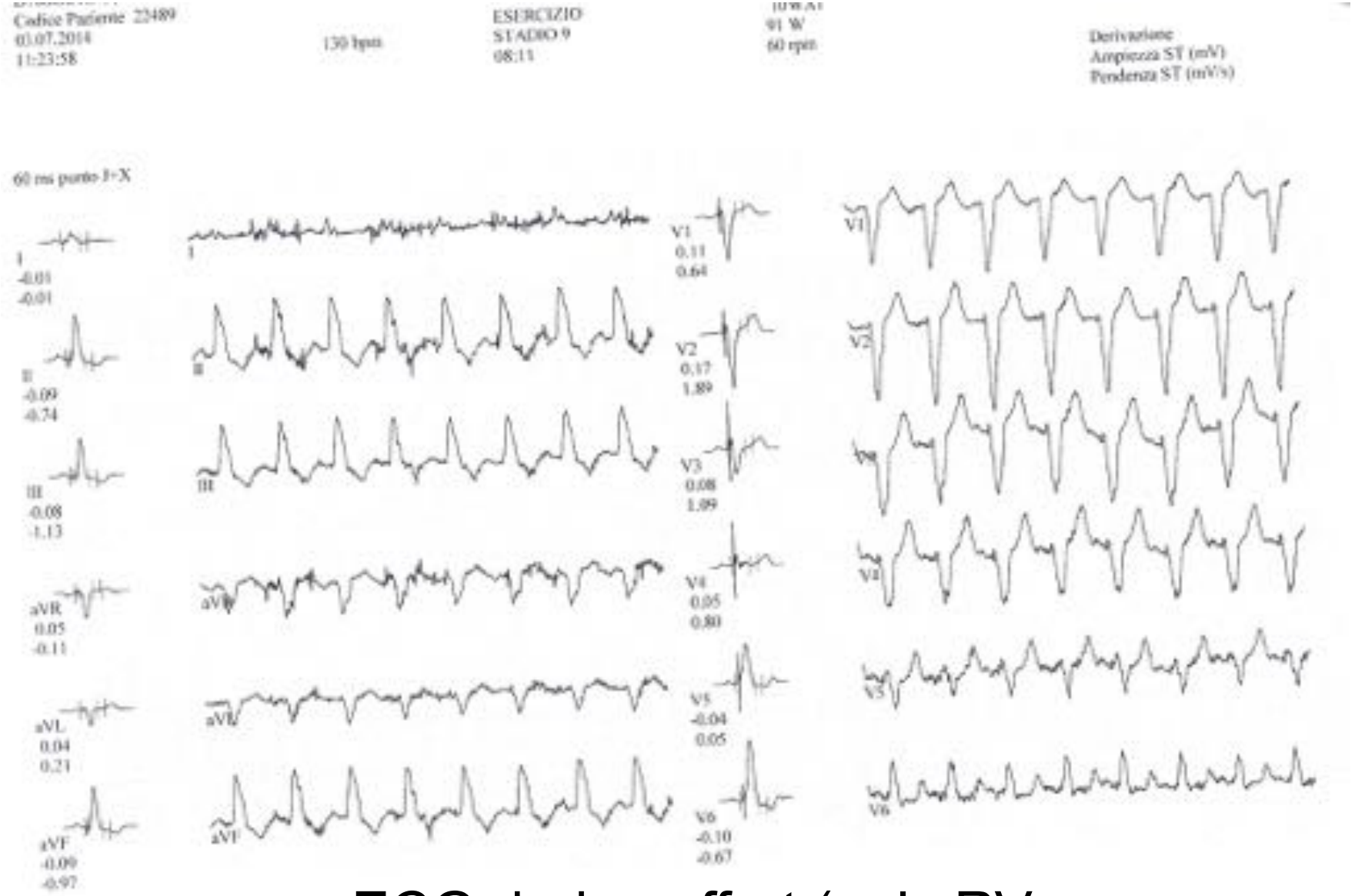
"Tachy" functions reprogramming: 0 patients (0%)

ICD activation threshold: TV 190±10 bpm, FV 200±10

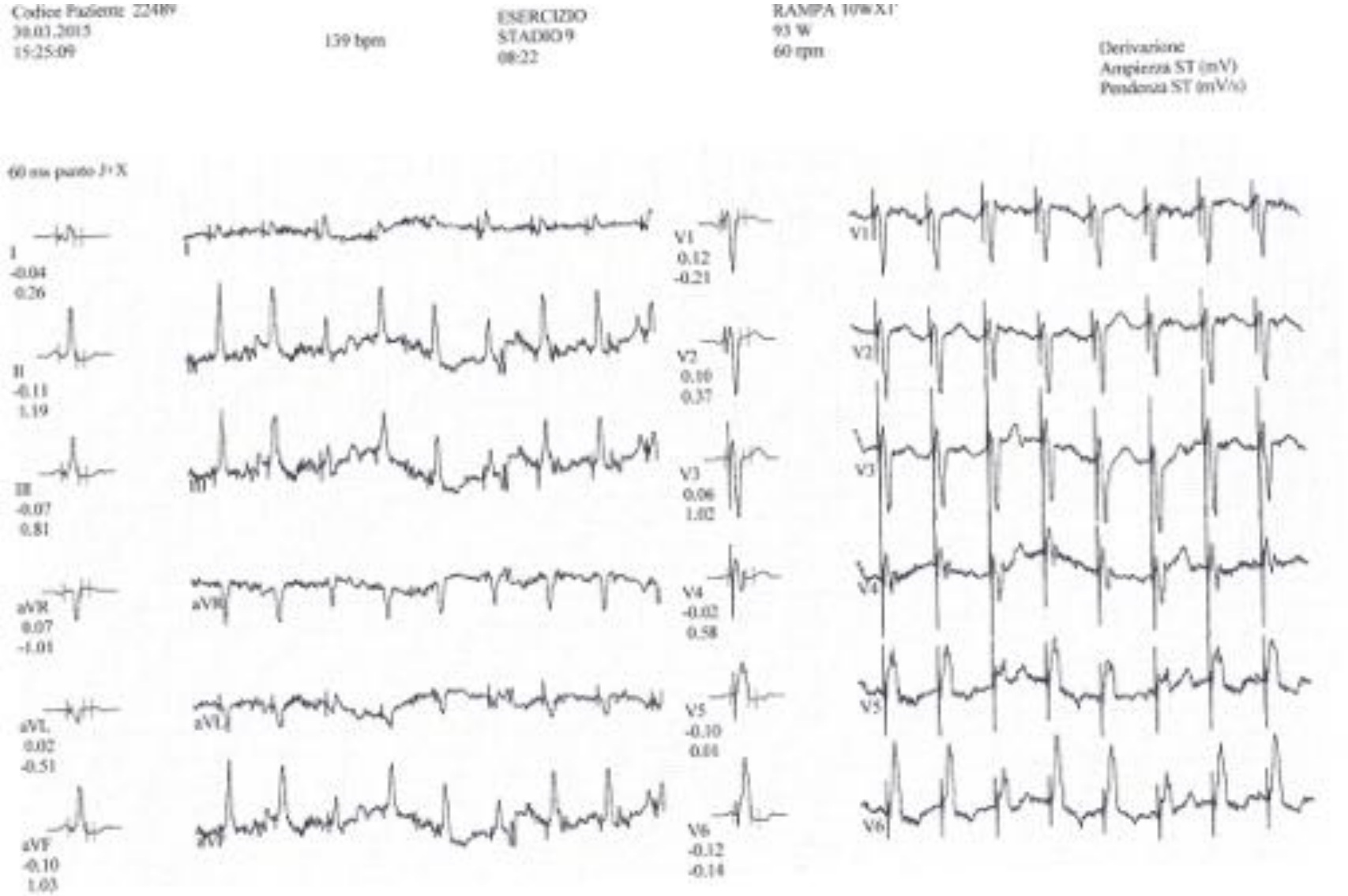
(AHA and EACPR recommend that peak target heart rates remain 10-20 beats below the ICD activation threshold)


60 ms punto J+X
I
-0.01
-0.42
II
-0.06
-0.61
III
-0.05
-1.18
aVR
0.04
-0.06
aVL
0.02
-0.30
aVF
-0.06
V1
0.11
0.10
V2
0.16
0.53
V3
0.07
-0.03
V4
-0.01
-0.14
V5
-0.02
-0.30
V6
-0.04
-0.41

ECG at rest



ECG during effort (only RV pacing-no LV capture)



ECG during effort after AV delay reprogramming (shortening)

CONCLUSIONS

•The growing applications of CRT-D in the treatment of CHF patients represent a unique challenge for CR therapists

• CR in CRT-D recipients is safe and effective

• In order to obtain the maximal increase in heart rate and to maintain resynchronization therapy during exercise, individualized device brady programming may be warranted in selected patients.

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European Heart Journal (2013) **34**, 2281–2329
doi:10.1093/eurheartj/eht150

ESC GUIDELINES

2013 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy

The Task Force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). Developed in collaboration with the European Heart Rhythm Association (EHRA).

European Heart Journal (2010) **31**, 2677–2687
doi:10.1093/eurheartj/ehq337

ESC GUIDELINES

2010 Focused Update of ESC Guidelines on device therapy in heart failure

An update of the 2008 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure and the 2007 ESC guidelines for cardiac and resynchronization therapy