Friday 16 morning - Barbantini Room

12.30-14.00

Sorin Group satellite symposium

Focus on: customizing CRT

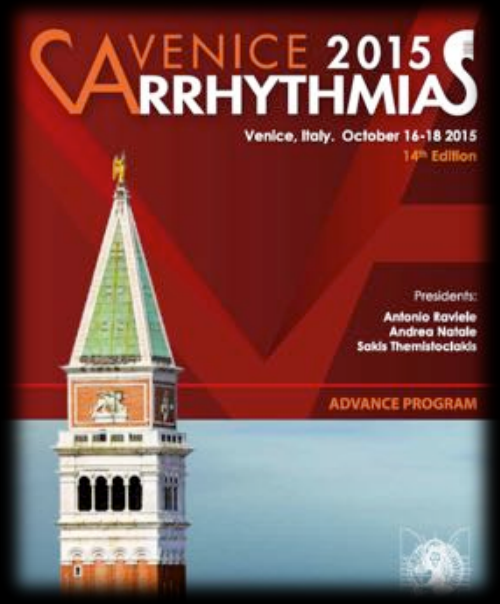
Chairmen: **L. Bontempi** / Brescia, Italy - **B. Sassone** / Cento, Italy

Automatic CRT optimization and follow up:
Clinical case 1 - monitoring
F. Zanon / Rovigo, Italy

Automatic CRT optimization and follow up:
Clinical case 2 - optimization
G. Mascioli / Bergamo, Italy

Multi area pacing to enlarge CRT effect
Clinical case 1
G. Zingarini / Perugia, Italy

Multi area pacing to enlarge CRT effect
Clinical case 2
E. De Ruvo / Rome, Italy



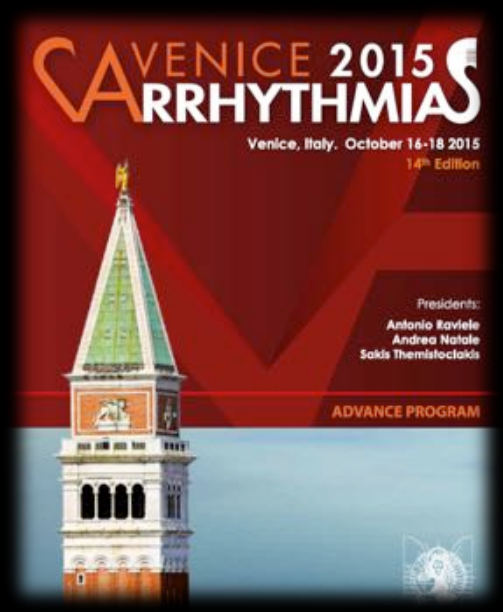
Satellite symposium
"Focus On: Customizing CRT"

Automatic CRT Optimization and Follow-Up

Clinical Cases 1 - MONITORING

REGIONE VENETO
AZIENDA ULSS 18
ROVIGO

ZANON Francesco, MD
Ospedale S. Maria della Misericordia
ROVIGO (Italy)



Satellite symposium
"Focus On: Customizing CRT"

Automatic CRT Optimization and Follow-Up

Clinical Cases 1 - MONITORING

Francesco Zanon, MD, FESC, FHRS
Arrhythmia and Electrophysiology Unit, Department of Cardiology "Santa Maria della Misericordia" General Hospital, Rovigo - ITALY

October 16 - 18
14th EDITION 2015

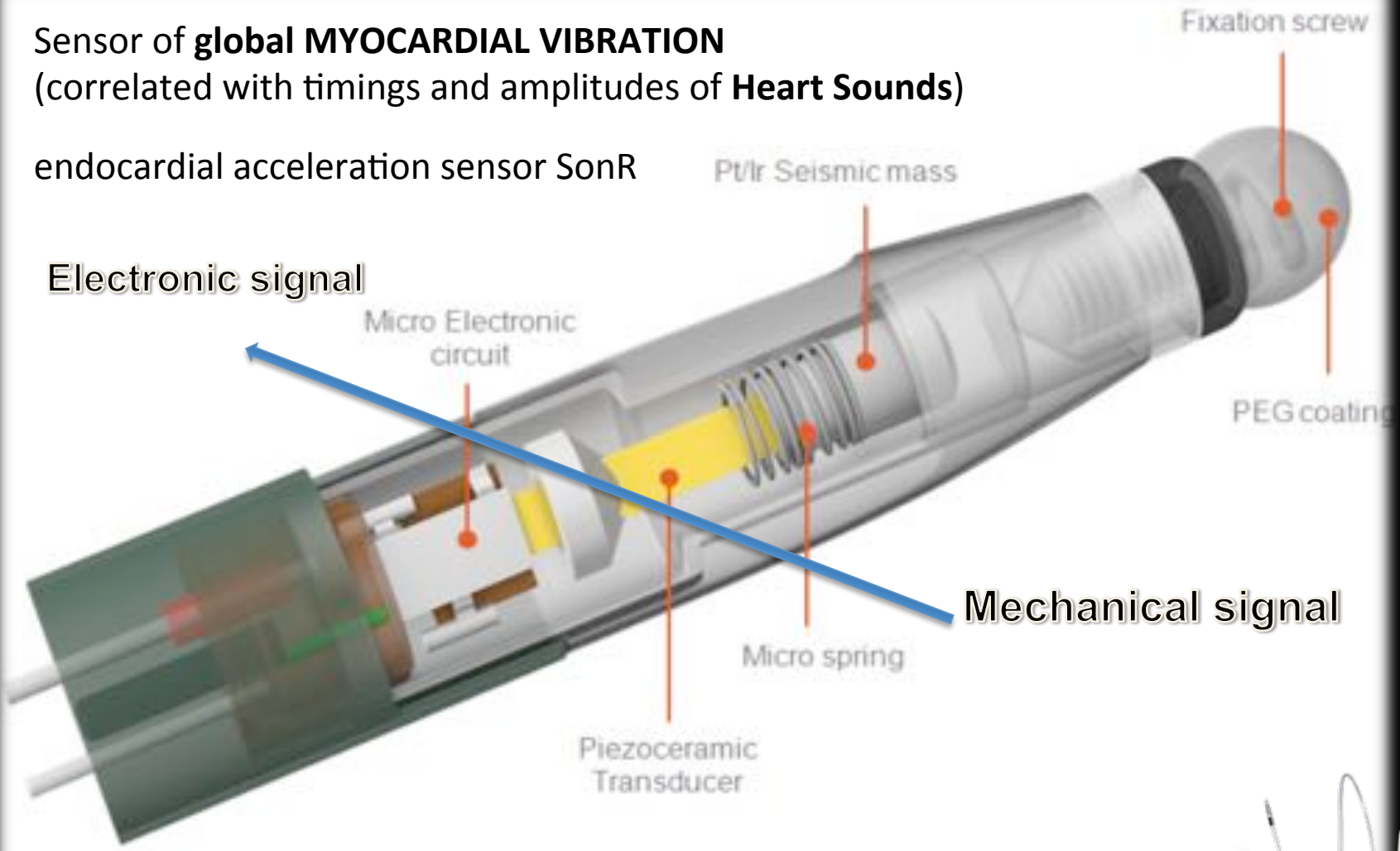
MY CONFLICTS OF INTEREST:

Boston Scientific
Sorin Group
Medtronic
St Jude Medical

Optimization based upon a hemodynamic sensor: the SonR technology *(atrial lead, SonRtip model, released Sept. 2011)*

Sensor of **global MYOCARDIAL VIBRATION**
(correlated with timings and amplitudes of **Heart Sounds**)

endocardial acceleration sensor SonR



Sacchi S & al (Univ. Careggi, Florence, Italy). *Hemodynamic Sensors in Cardiac Implantable Electric Devices: The Endocardial Acceleration Technology*. J Healthcare Eng. 2013;4:453-64

Optimization based upon a hemodynamic sensor: the SonR technology *(atrial lead, SonRtip model, released Sept. 2011)*

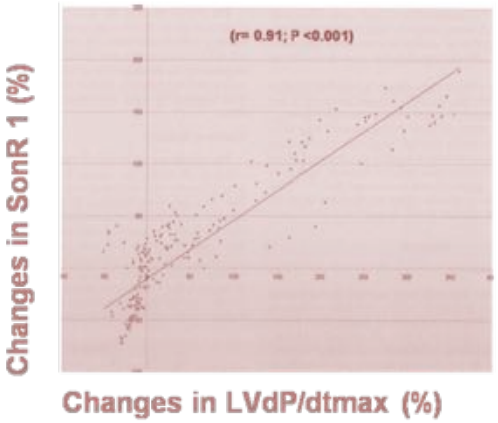
is able to detect the vibrations related to the isovolumic contraction of the from the LV without being influenced by the LOCAL atrial mechanical activity.

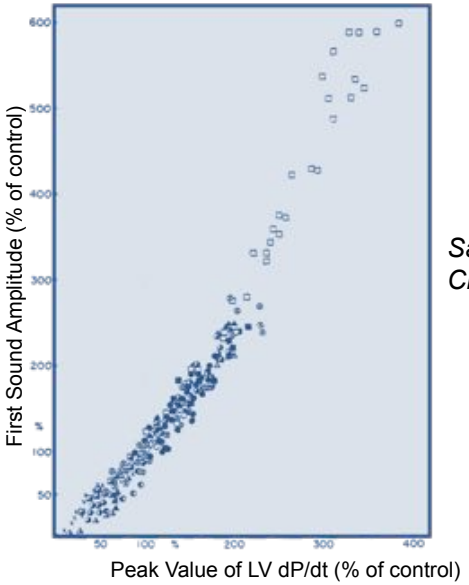
Sacchi S & al (Univ. Careggi, Florence, Italy). *Hemodynamic Sensors in Cardiac Implantable Electric Devices: The Endocardial Acceleration Technology*. J Healthcare Eng. 2013;4:453-64

Contractility (LVdP/dt) ⇔ Heart Sounds ⇔ SonR

Acute LV dP/dt_{max} correlates with S1

Bordachar P & al. JCE 2008



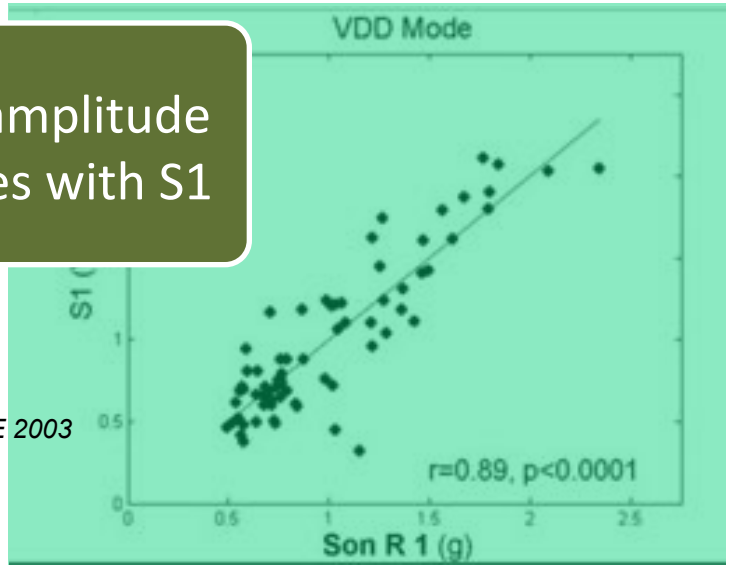


Sakamoto & al.
Circ Res 1965;16:45-7

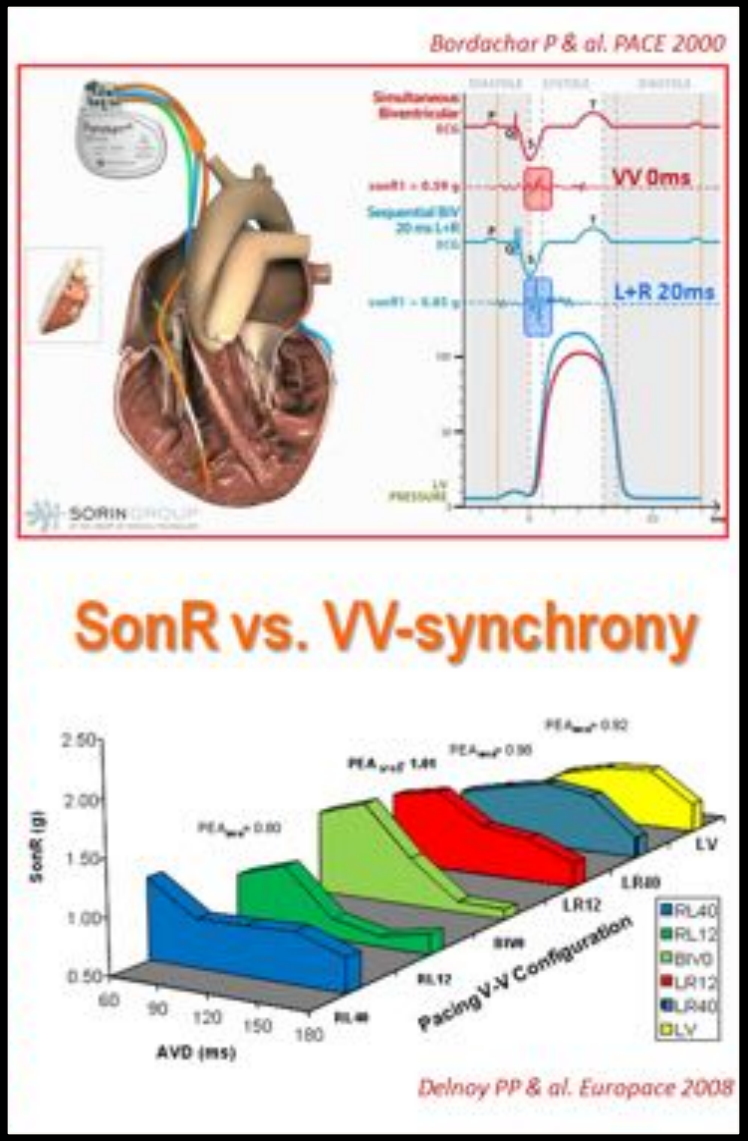
SonR-1 correlates with LV dP/dt_{max}

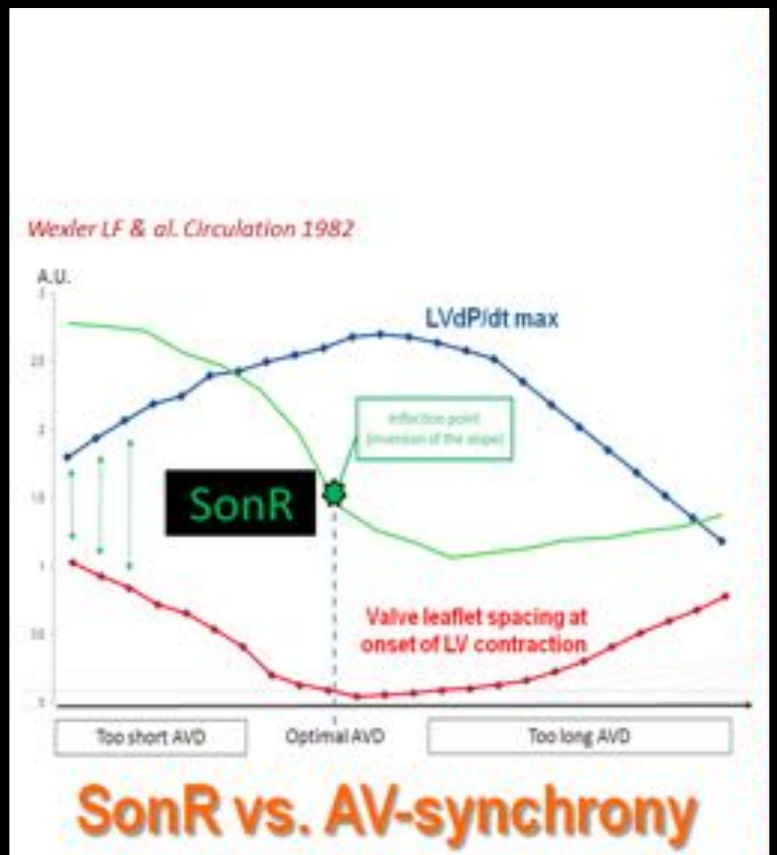
SonR-1 amplitude correlates with S1

Dupuis M & al. PACE 2003



The SonR algorithm: weekly automatic reprogramming of optimal AVD/VVD *(based upon contractility)*

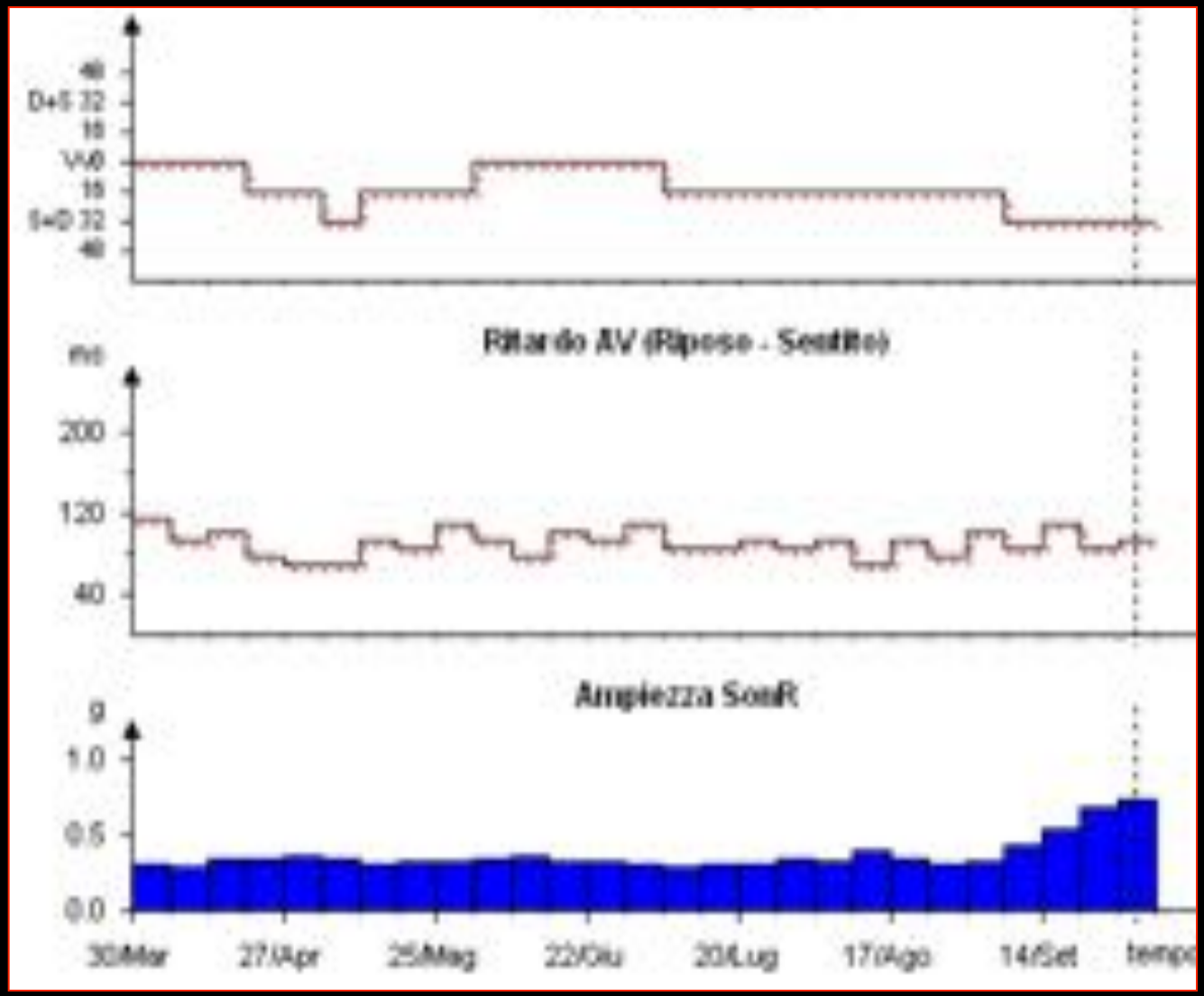




algorithm able to optimize CRT settings according to a direct measure of a hemodynamic parameter (SonR1 correlated with LV dP/dt).

Sacchi S & al (Univ. Careggi, Florence, Italy). *Hemodynamic Sensors in Cardiac Implantable Electric Devices: The Endocardial Acceleration Technology*. J Healthcare Eng. 2013;4:453-64

What data do we see when the SonR sensor works ?



Weekly Optimal VVD

Weekly Optimal AVD
(rest/exer; sens/paced)

Weekly SonR amplitude
(trend of contractility)

CLINICAL CASES

CASE 1

CASE 1

Male pt, 57 yrs old, 2-ary prevention ICD indications:

HF in NYHA class 3, OMT, LVEF 34%,
implanted with a **VVI-ICD in Y-2008** (2-ary prev: symptomativ VTs)
Non-Ischemic etiology, severe mitral insufficiency 3+
ECG: QRS 155ms, **LBBB**, SR @ 50bpm, Long PR

Clinical history / Co-morbidity:

anemia, COPD, diabetes mellitus,
renal failure, systemic arterial hypertension

Basal ECHOCARDIO:

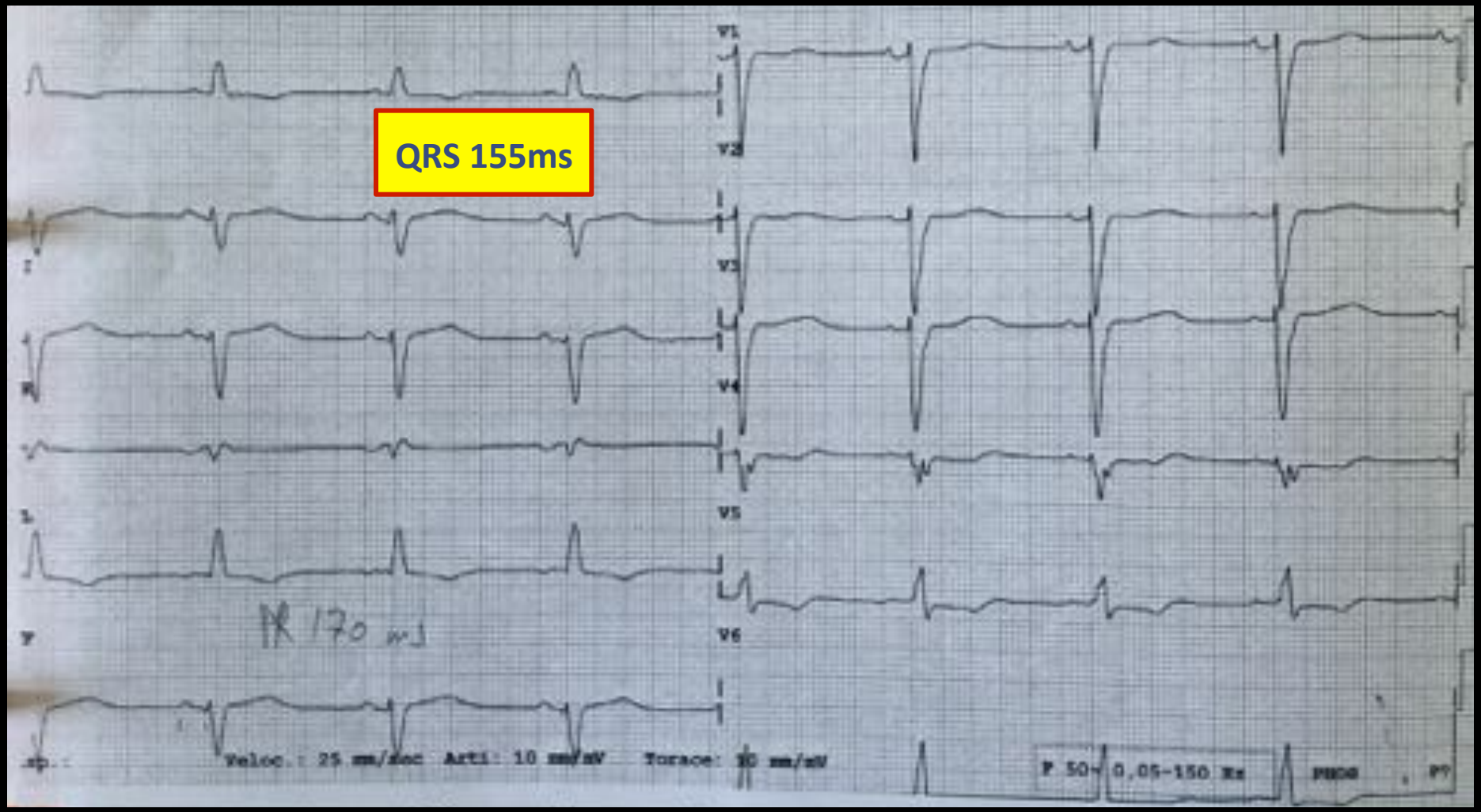
LVEF 34% (LVEDV 242ml; LVESV 159ml)
LPEI 129ms
Jet-Area MR 6.0cm^2

Sept 2012: hospitalized for planned upgrading VVI-ICD → CRT-D

non optimal conditions suggesting an optimal response to CRT ...
Many comorbidities, a severe Mitral Insufficiency, many doubts ...
how can we handle this patient during FU ?

CASE 1

Pre-implant ECG (M, 57 yrs); SR @ 50bpm, LBBB



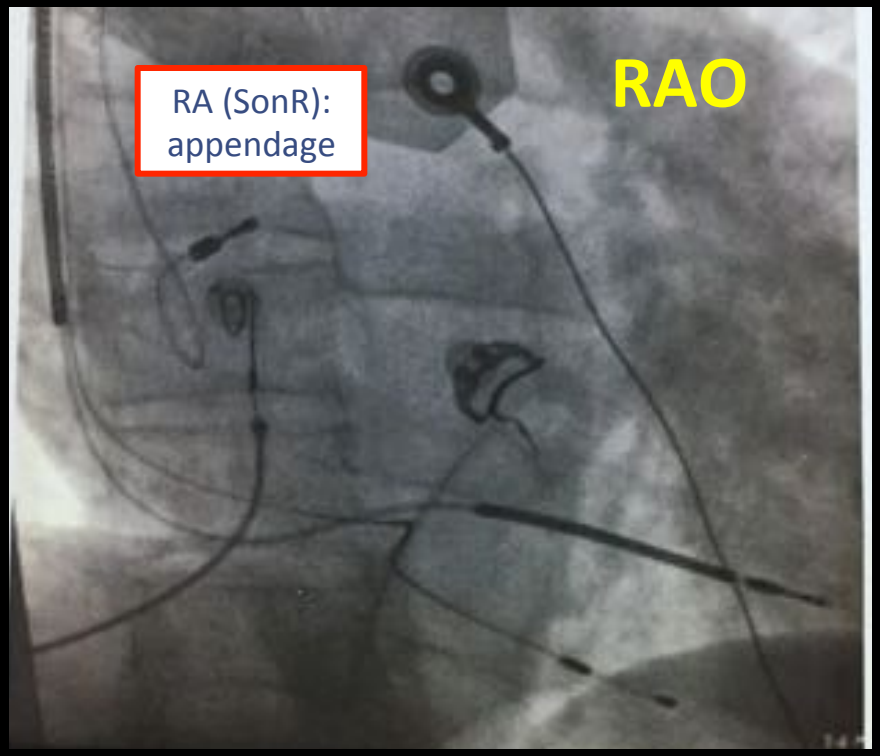
CASE 1

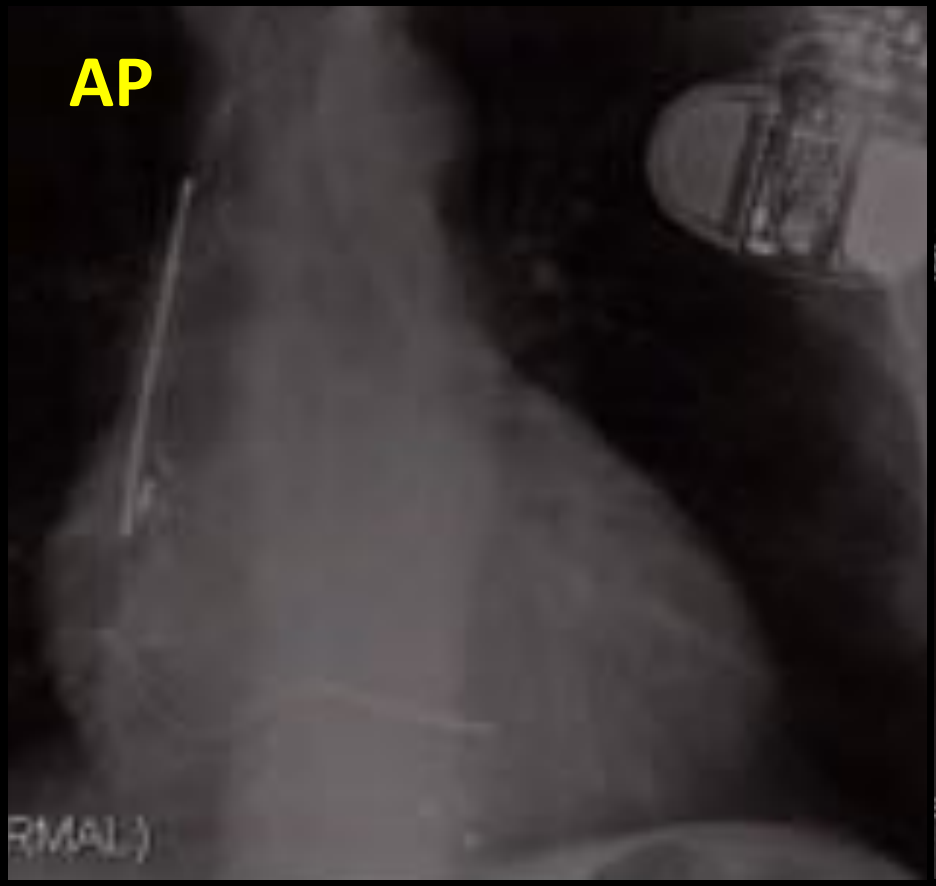
IMPLANT (October 2012)

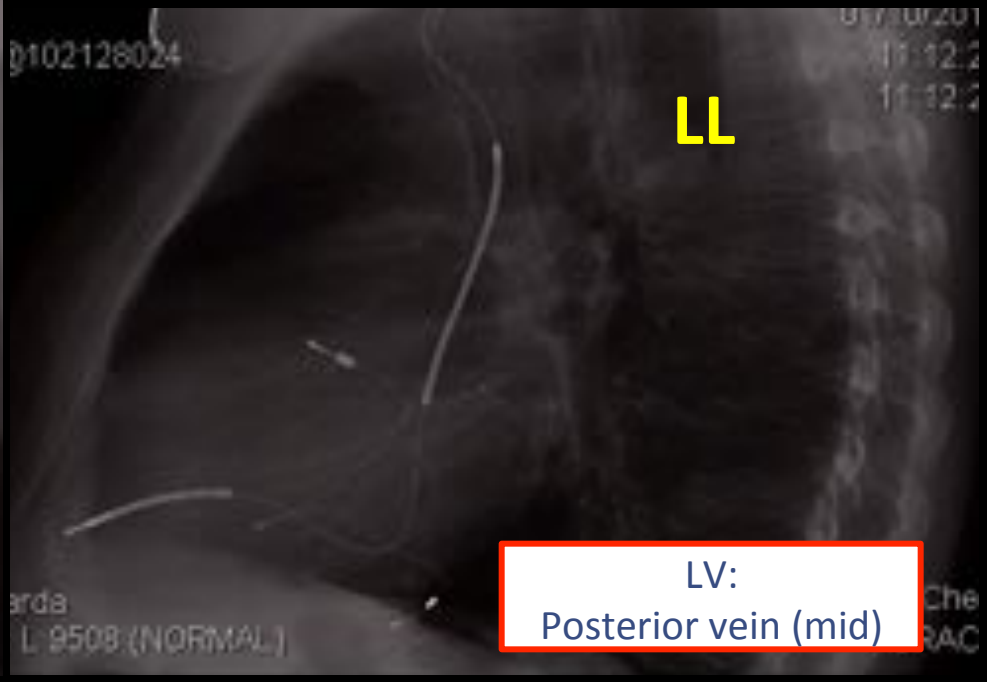
CRT-D system with SonR sensor

(contractility, correlated with LV dP/dt))

Weekly Automatic Optimization SonR = ON
(optimization of AVD & VVD)







CASE 1

Clinical variables during FU (2Y)

	NYHA	QRS (ms)	BiVp (%)	events	Med thx	Arrh.	Notes
Pre-CRT	III	155	-	-	OMT	-	-
M1	II	155	95	No	↑ furosemide	5% PVCs	orthopnea
M3	II	150	93	No	-	6% PVCs	-
M6	II	155	97	No	-	3% PVCs	dyspnea
M12	II	135	98	No	Thx. for BPI	2% PVCs	pollyach.
M18	II	160	98	No	-	2% PVCs	weight loss
M24	II / III	145	98	Respir. Insuff. + "initial HF" *(5 days hospital.)*	Stop amiod.	2% PVCs	noct. cough

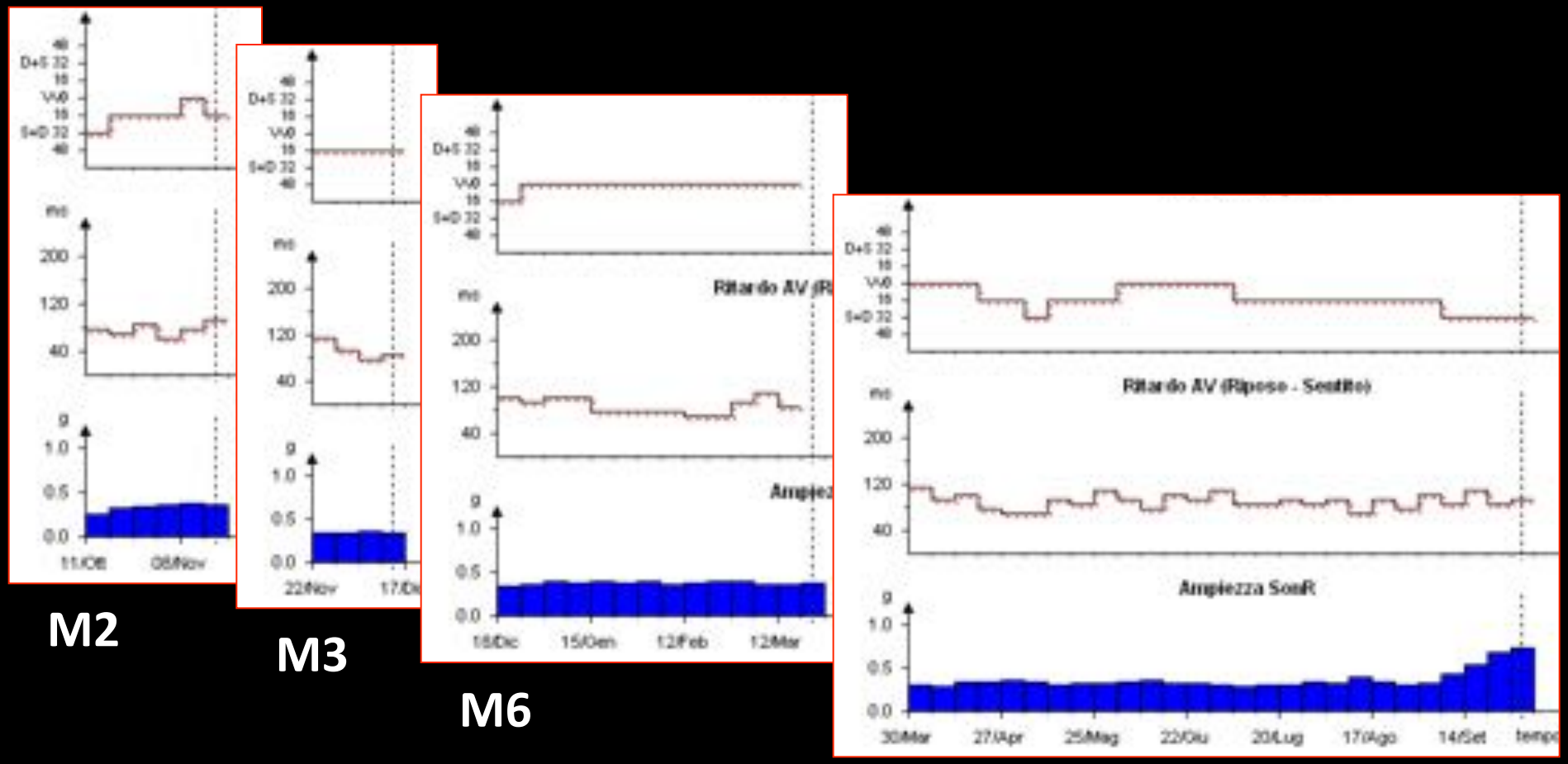
Hemodynamic variables during FU (1Y)

	LVEF (%)	LVEDV (ml)	LVESV (ml)	LPEI (ms)	Jet-A MR (cm^2)	Notes
Pre-CRT	34	242	159	129	6.0	-
M12	35	181	117	94	2.3	-
	😐			☺	☺	

CASE 1

How much did the SonR sensor work ?

Now looking at the SonR sensor activity ...
Which kind of information can we see?



M2

M3

M6

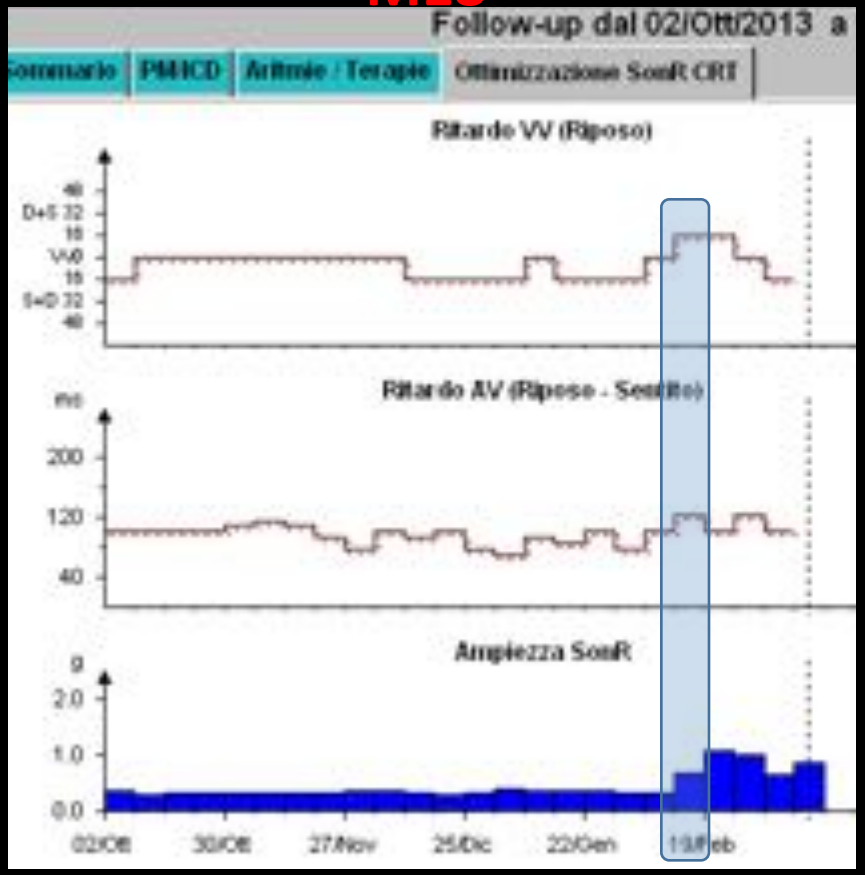
M12

The SonR signal, in agreement with the clinical trend, is stable for roughly 1Y.
However, at M12 a rapid increase in contractility ... what happened ?

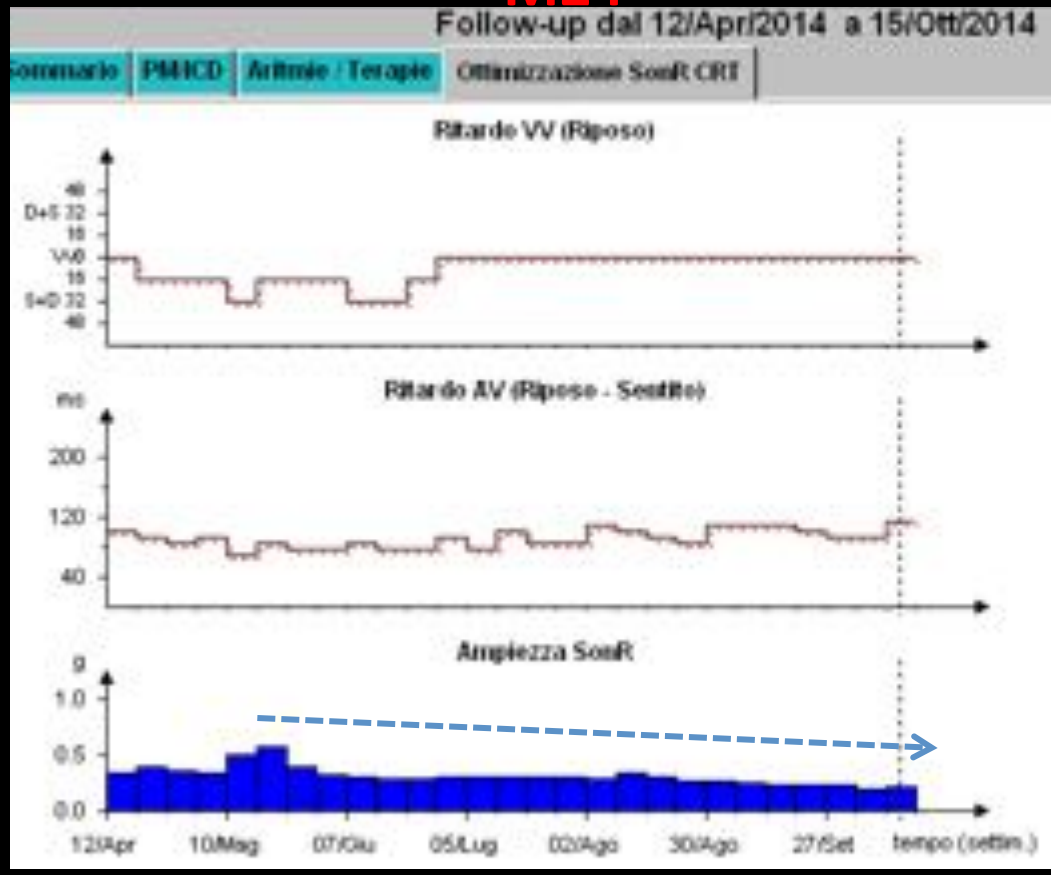
CASE 1

How much did the SonR sensor work ?

M18



M24



Hospitalized for 5 days (iatrogenic pulmonary fibrosys, stop amiodarone):
SonR amplitude increased during hospitalization

- ***Slow clinical and functional worsening***
- ***CRT probably is not enough to slow-down the disease evolution***

CLINICAL CASES

CASE 2

CASE 2

Male pt, 66 yrs old:

HF in NYHA class 3, OMT, LVEF 25%

1-ary prev, MADIT II

Ischemic etiology (acute MI)

ECG: QRS 160ms, **RBBB + LAH**, SR @ 59bpm

Clinical history / Co-morbidity:

History of Paroxysmal AF

CRT-D implant:

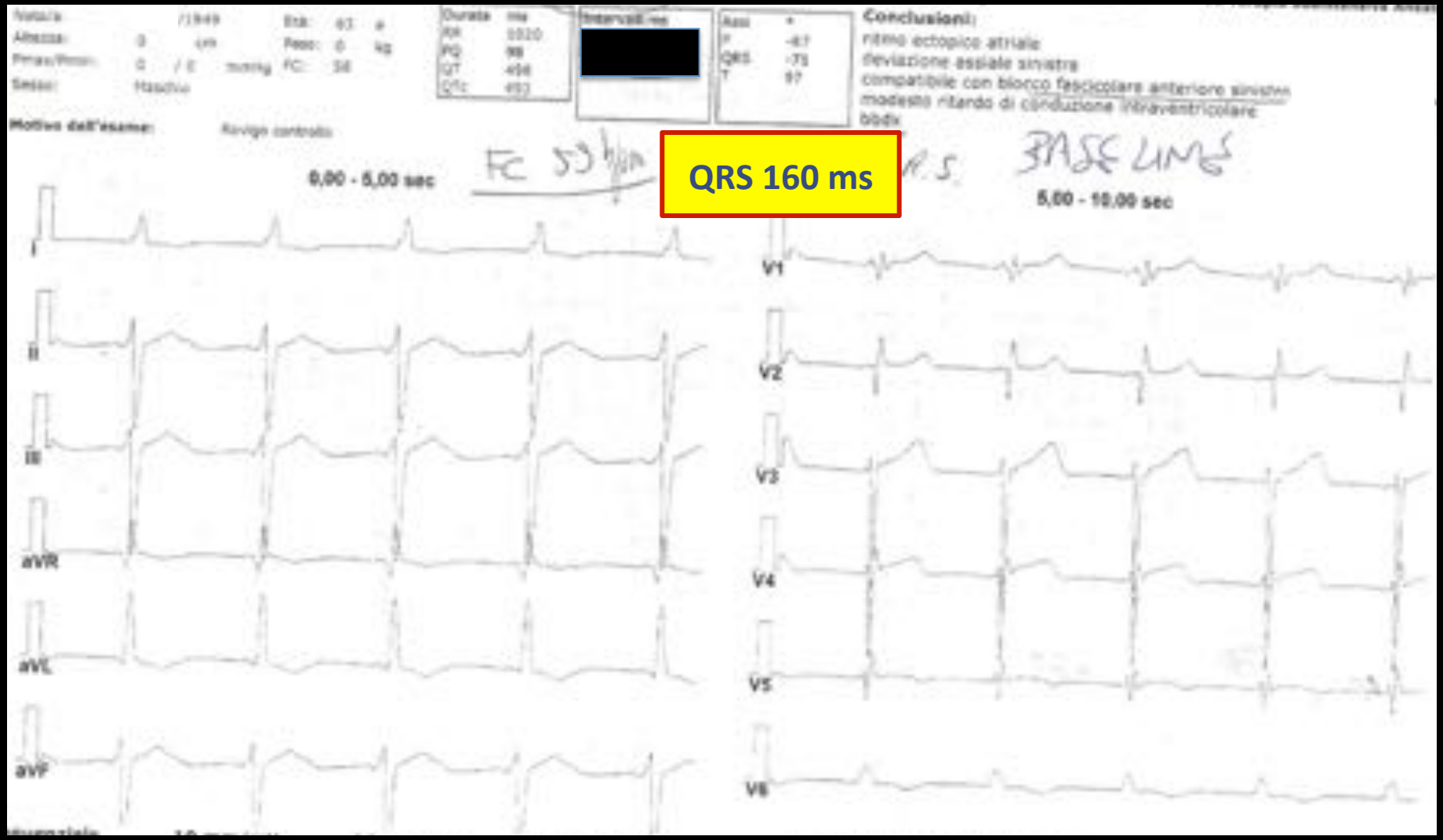
September 2013 (Paradym SonR CRT-D system)

Device Programming:

SonR optimization function OFF

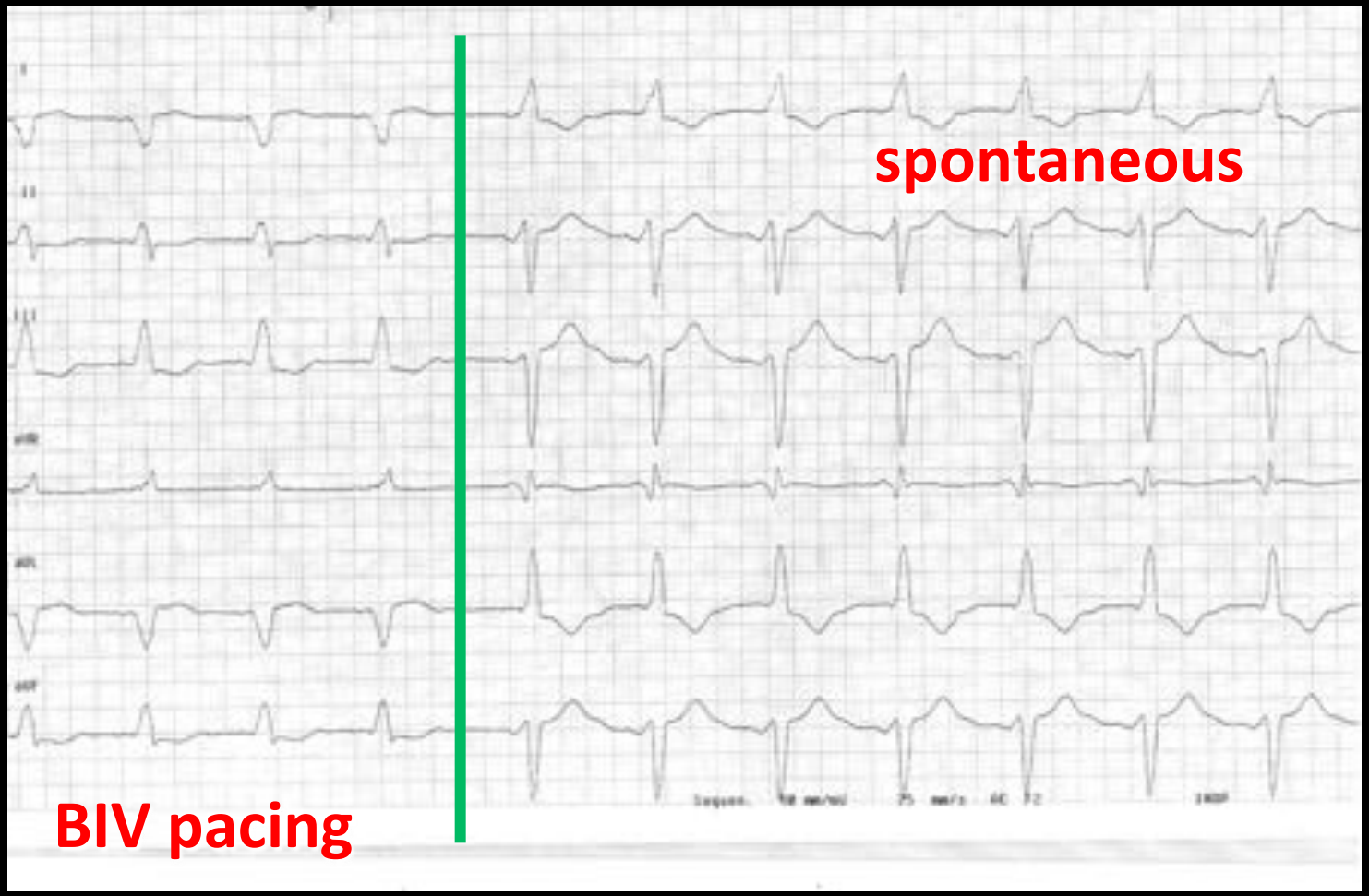
CASE 2

ECG: QRS 160ms, **RBBB + LAH**, SR @ 59bpm



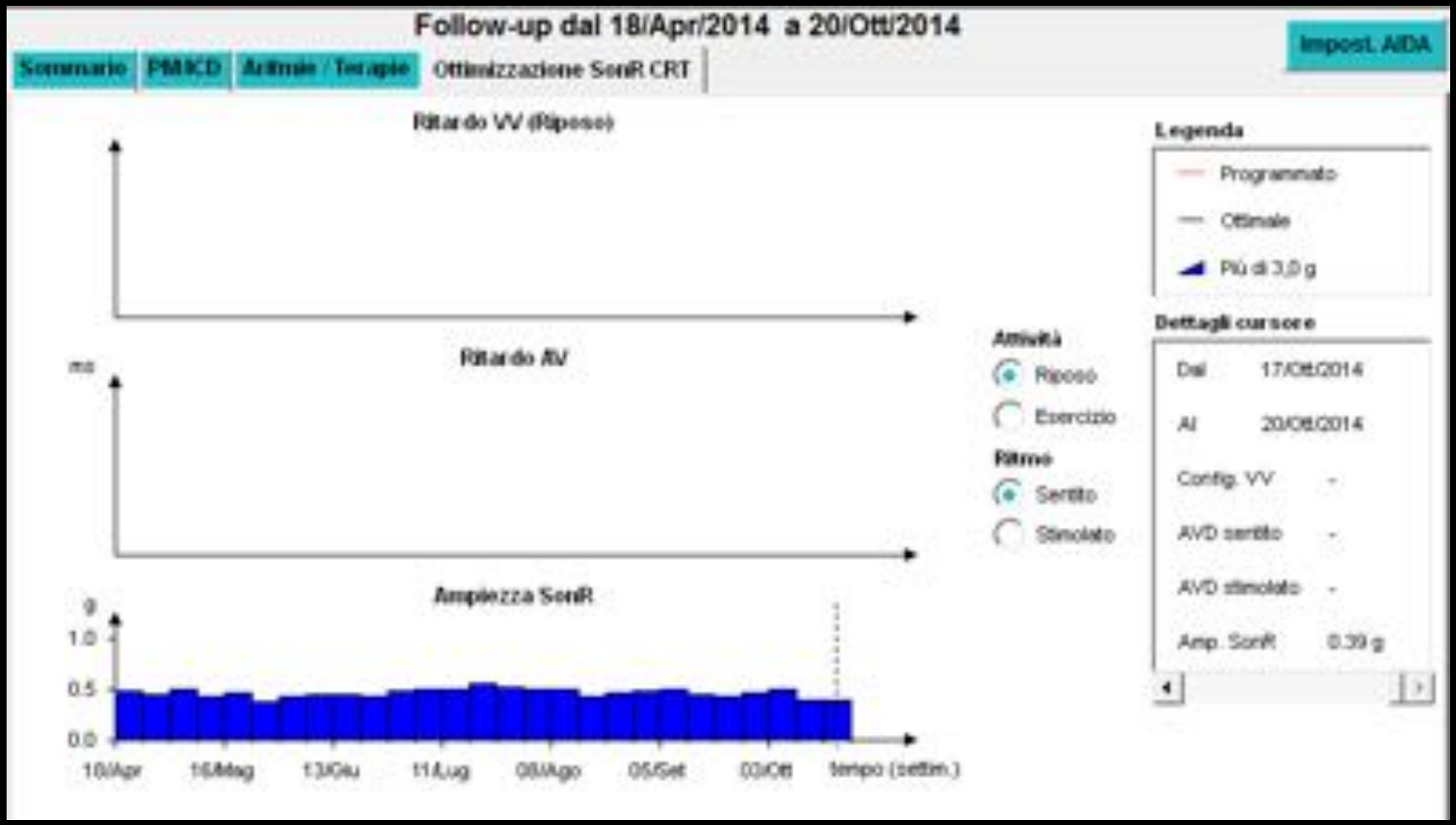
CASE 2

M12 FU visit (Oct 2014)



CASE 2 M12 FU visit (Oct 2014)

"Flat" SonR amplitude trend (M6 → M12) …



At 12M FU the trend of contractility (6M to 12M FU) appears stable or slightly decreasing, suggesting a limited CRT efficacy. The SonR optimization system is set to OFF, so there are no information available about the AV and VV delay evolution (the settings programmed at implant time were maintained for the first year).

CASE 2

M12 FU visit (Oct 2014)

- No clinical benefit from CRT is observed (pt labeled as Non-Responder)
- LVEF 20%
- NYHA class III
  - dyspnea during very modest efforts
  - **Patient qualifies for hearth transplant list …**

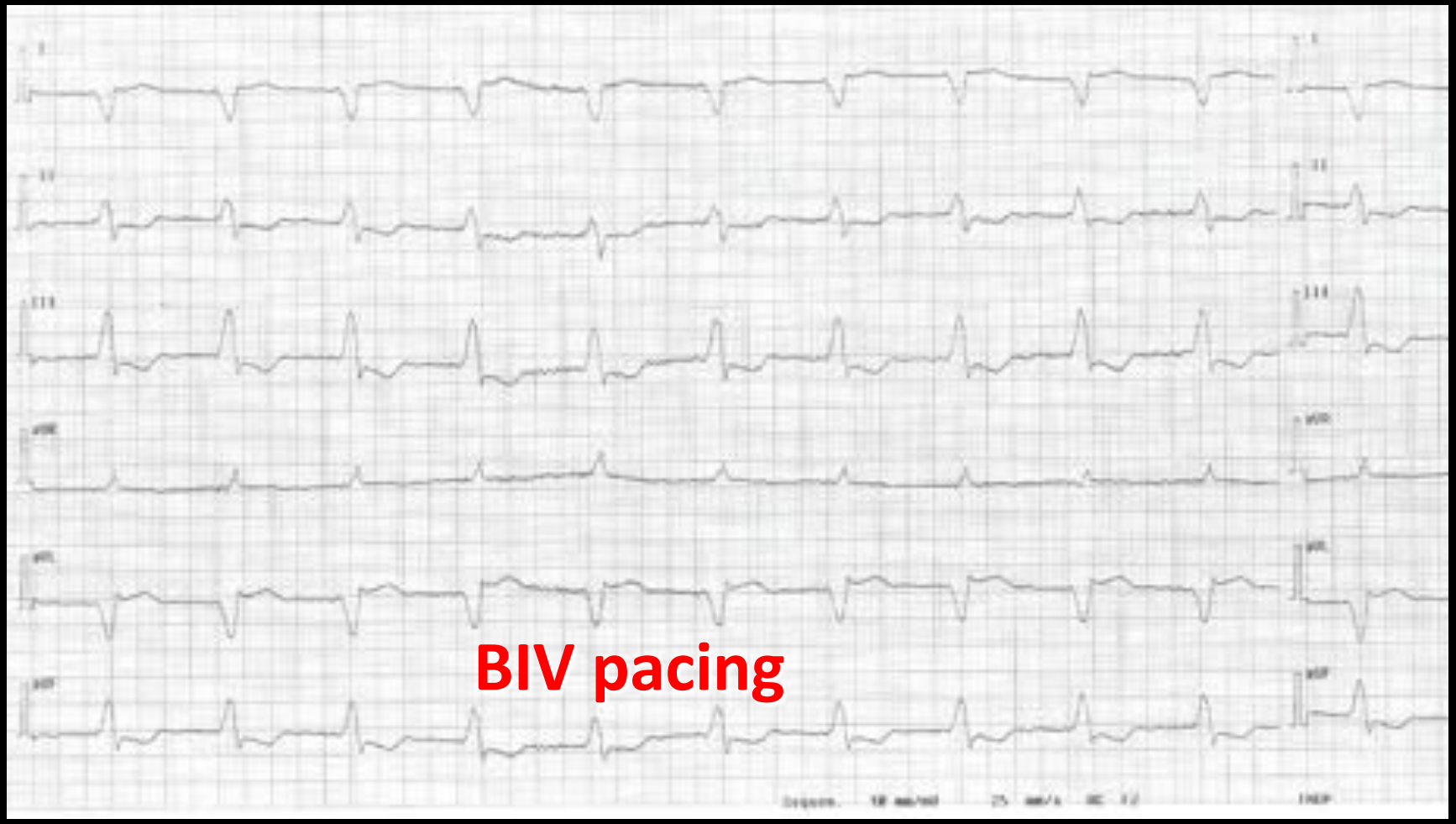
Extrema Ratio before giving up …

Switch SonR optimization function ON to try to get ANY KIND of **potential benefit from CRT …**

CASE 2

M13 FU visit (Nov 2014)

SonR optimization function activated a month before …



CASE 2

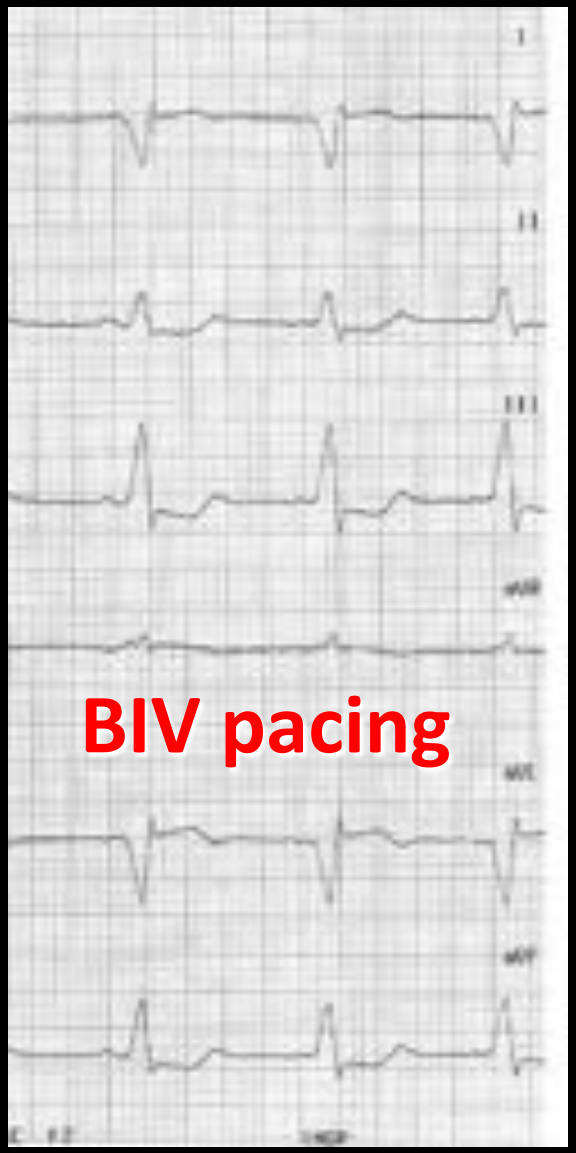
M18 FU visit (March 2015)

Pt labeled as Super-Responder

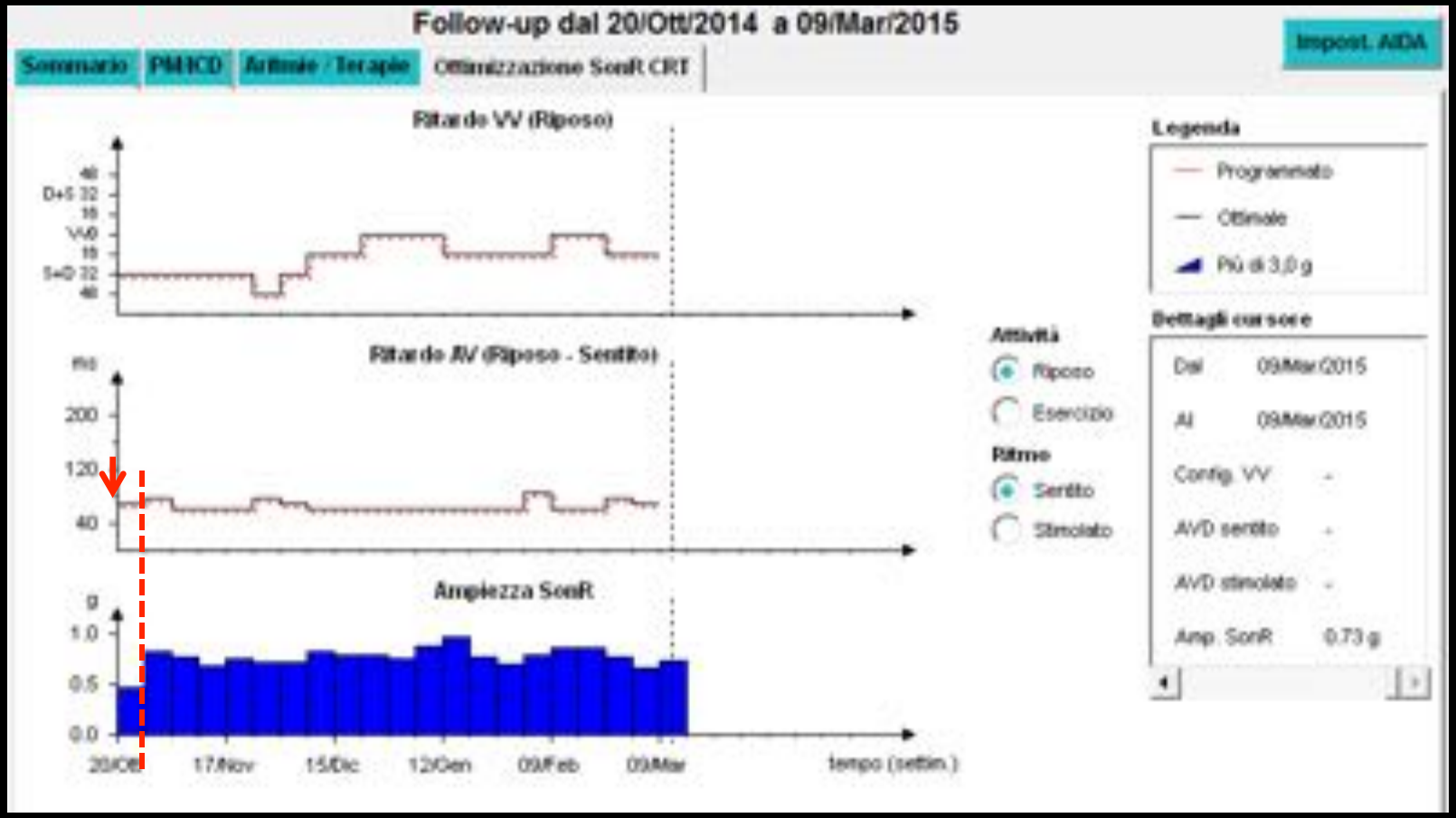
NYHA class I

Very light dyspnea for relevant efforts (walking, riding bicycle, level of physical activity strikingly improved)

Pt subjectively and objectively improved …



CASE 2 M18 FU visit (March 2015)



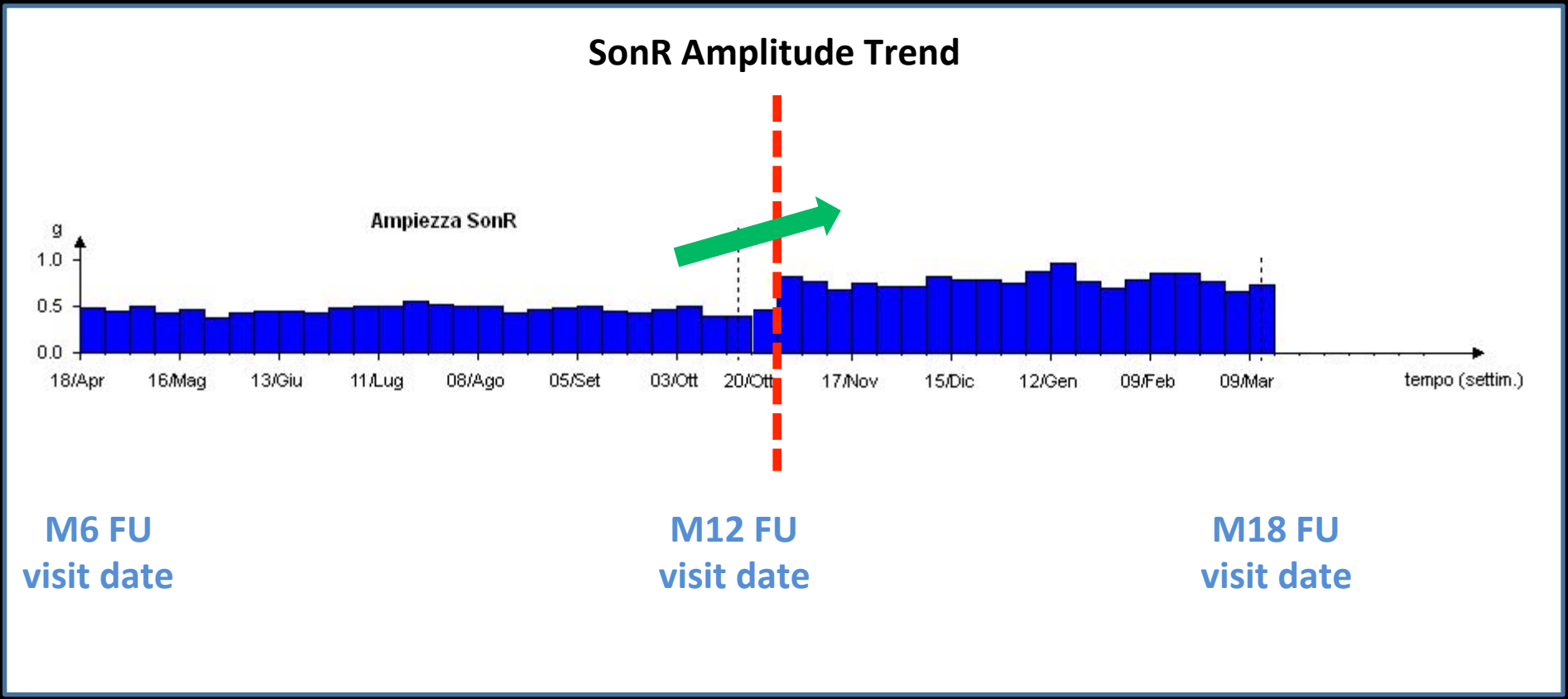
SonR function switched ON

M18 FU visit date

SonR contractility histograms confirm increase in global contractility when SonR algorithm is set to ON, a sudden and striking increase is observed. The AV delay is immediately shortened to about 80 ms and it then remains almost constant. The VV delay was initially reprogrammed with an important LV-RV delay, then it moved gradually towards synchronous LV-RV pacing (VV0ms).

CASE 2

M18 FU visit (March 2015)



The overall increase in contractility is really huge (contractility nearly doubled).
This improvement is maintained during the entire next period of 6M FU (up to 1.5Y FU)

Conclusions and Perspectives

- The SonR endocardial acceleration sensor can be an useful tool to look at hemodynamic response of CRT pts during FU

- Variations in CRT pts' status (sudden or progressive) can be tracked when interrogating the device

- Contractility trends can be also evaluated by using Remote Monitoring systems (alarms could be triggered in presence of specific trends & in association with other variables, such as V arrhythmias, %Vp, AF, etc)

- Hemodynamic monitoring in CRT pts is an added value for clinicians: preliminarly observed in isolated cases, SonR trends can be the object of dedicated clinical research (prospective assessment vs. validated clinical variables)

Thanks for your attention

Francesco Zanon, MD, FESC, FHRS
Arrhythmia and Electrophysiology Unit, Department of Cardiology "Santa Maria della Misericordia" General Hospital, Rovigo - ITALY