I can follow my patient's evolving status

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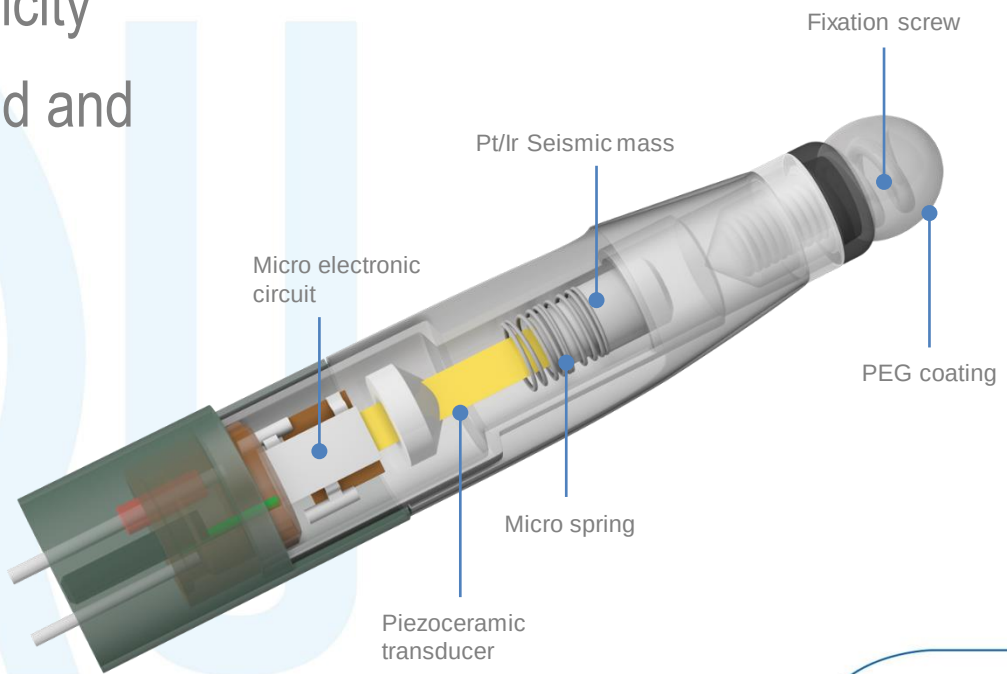
Disclosures

- Research and expertise fees : ABBOTT, Biotronik, Boston Scientific, Medtronic, Microport

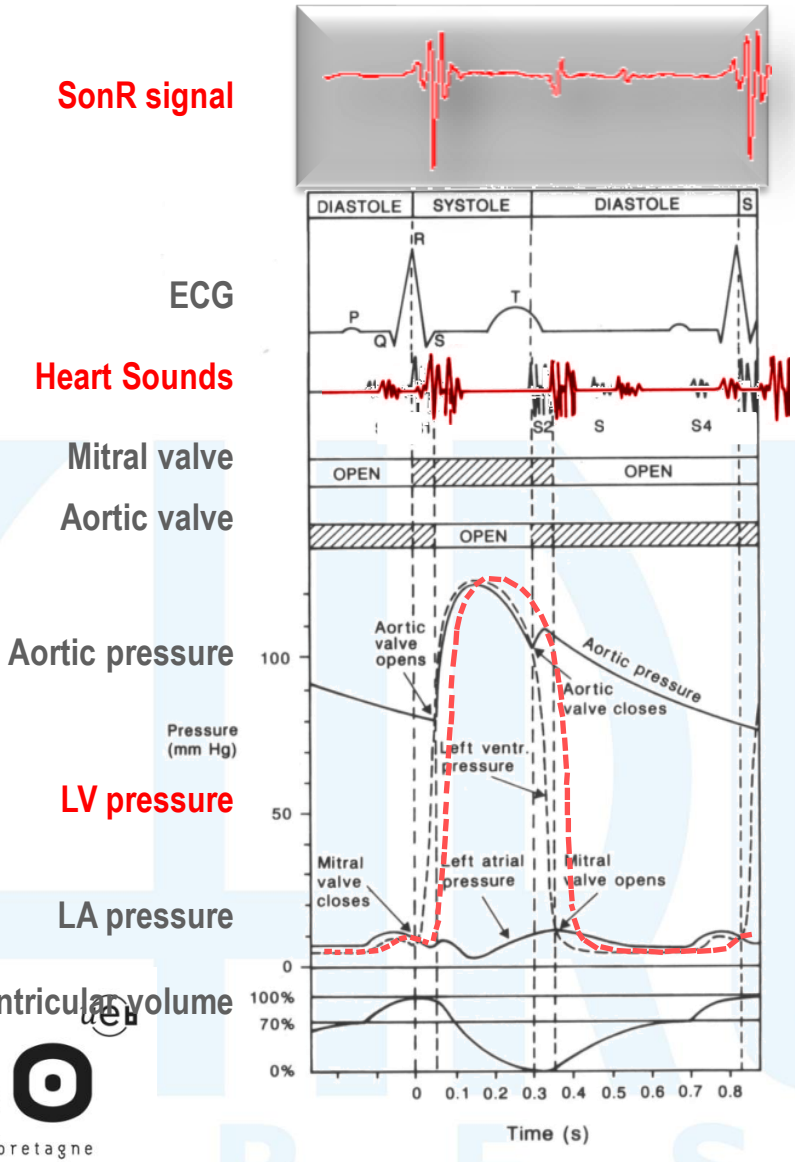
SonR tip

SonRtip is an atrial pacing lead featuring an embedded hermetically-sealed micro-accelerometer

- The SonRtip sensor is a piezoceramic transducer, converting vibrations to electricity
- The sensor signal is amplified and transmitted to the SonR CRT-D device



The SonR signals



SonR 1 signal amplitude correlates to $LVdP/dt_{max}$[1]– AV optimisation application

SonR 1 and 2 signals occur at the same time as heart sounds (valve closures)

SonR yields information on the contractility and the duration of the contraction

1. Bordachar P, Labrousse L, Ploux S et al. J Cardiovasc Electrophysiol 2008;19(7):725-9.

SonR – Systematic optimization

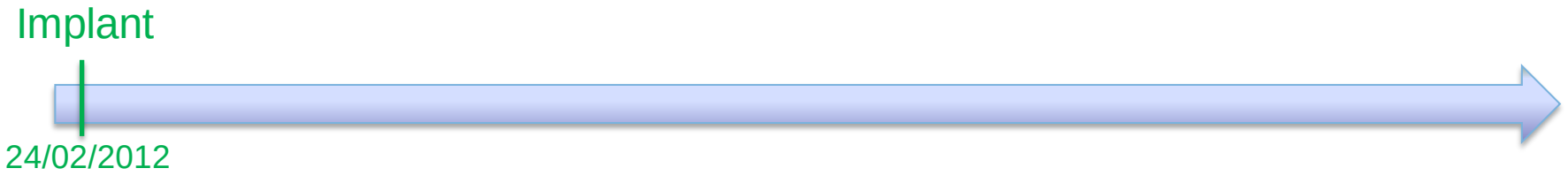
SonR provides weekly self-adjusting optimization of AV and VV delays

- For the optimal VV configuration, the optimal AV delay can be determined on a weekly basis[1]
- Every week, SonR tests 64 combinations for rest optimization
- Every week, SonR tests 5 combinations for exercise optimization
- By contrast, echo optimization uses far fewer AV delay settings to optimize AV and VV delays

1. Ritter P, Padeletti L, Delnoy PP et al. Device-based AV delay optimisation by peak endocardial acceleration in cardiac resynchronisation therapy. Heart Rhythm 2004;1(1S):377.

Case 1

Patient Clinical History

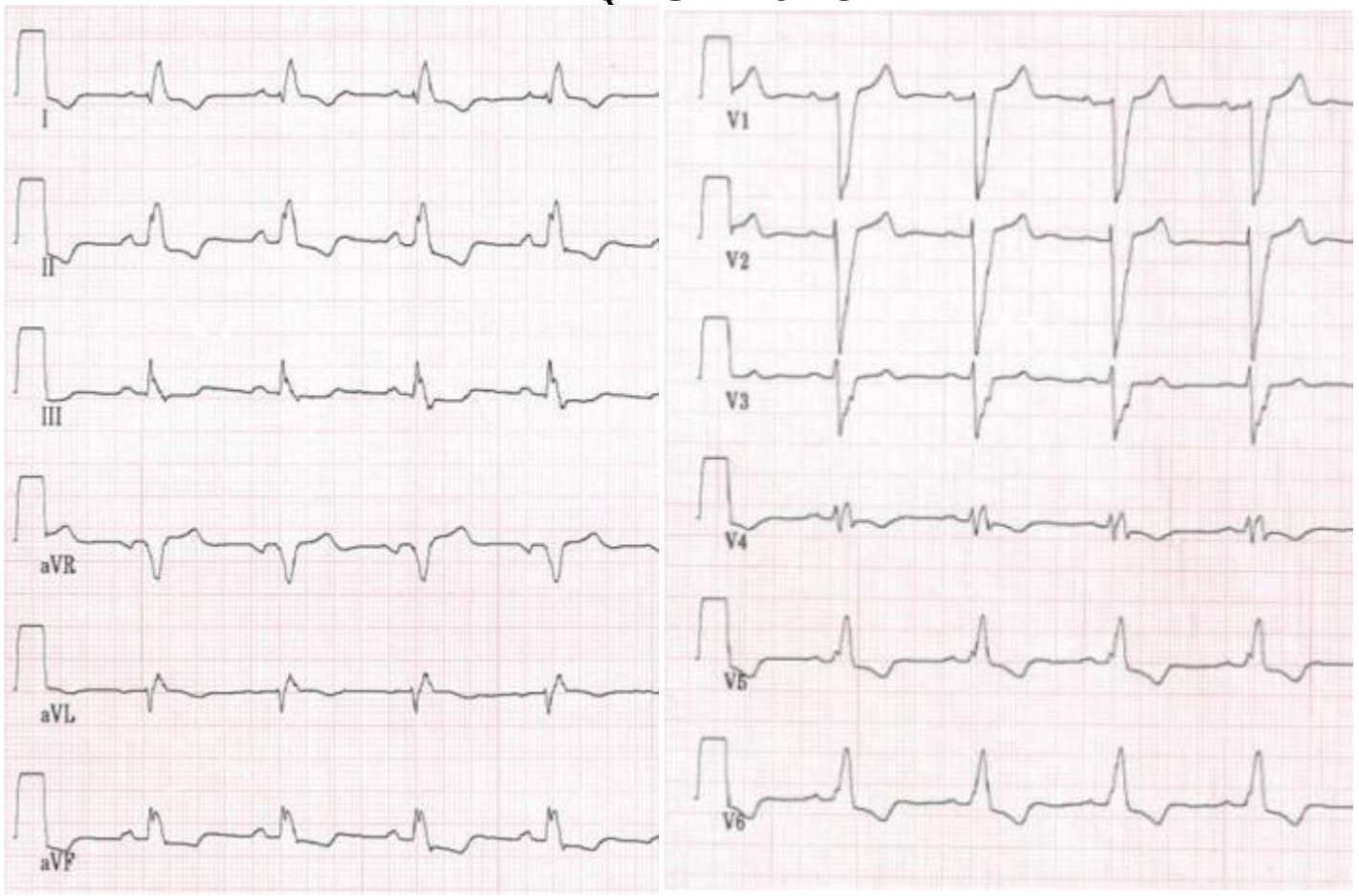


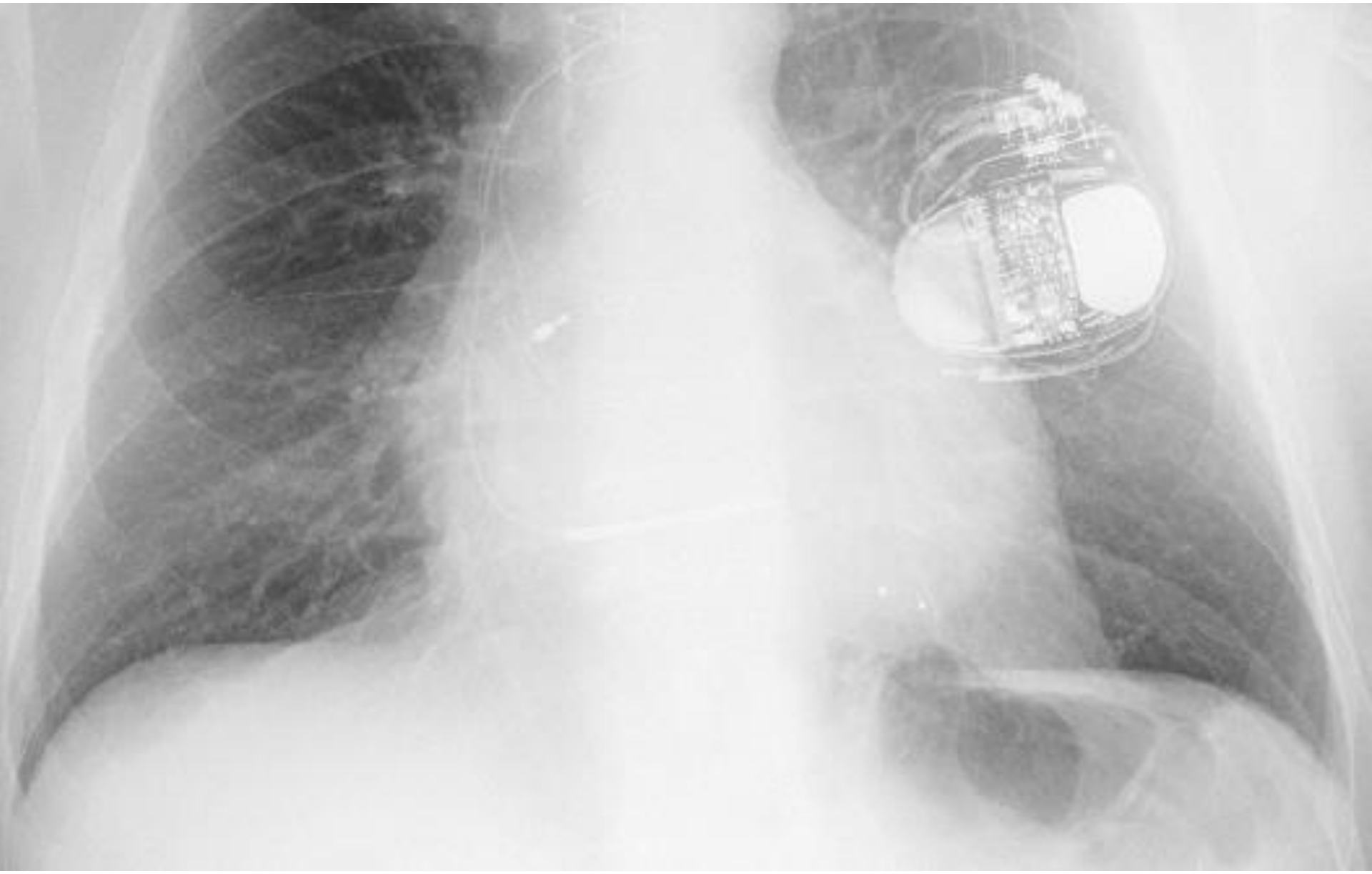
- Male, 70 years old
- Ischemic cardiomyopathy
- NYHA class III, LVEF: 29%
- LBBB, QRS = 170ms

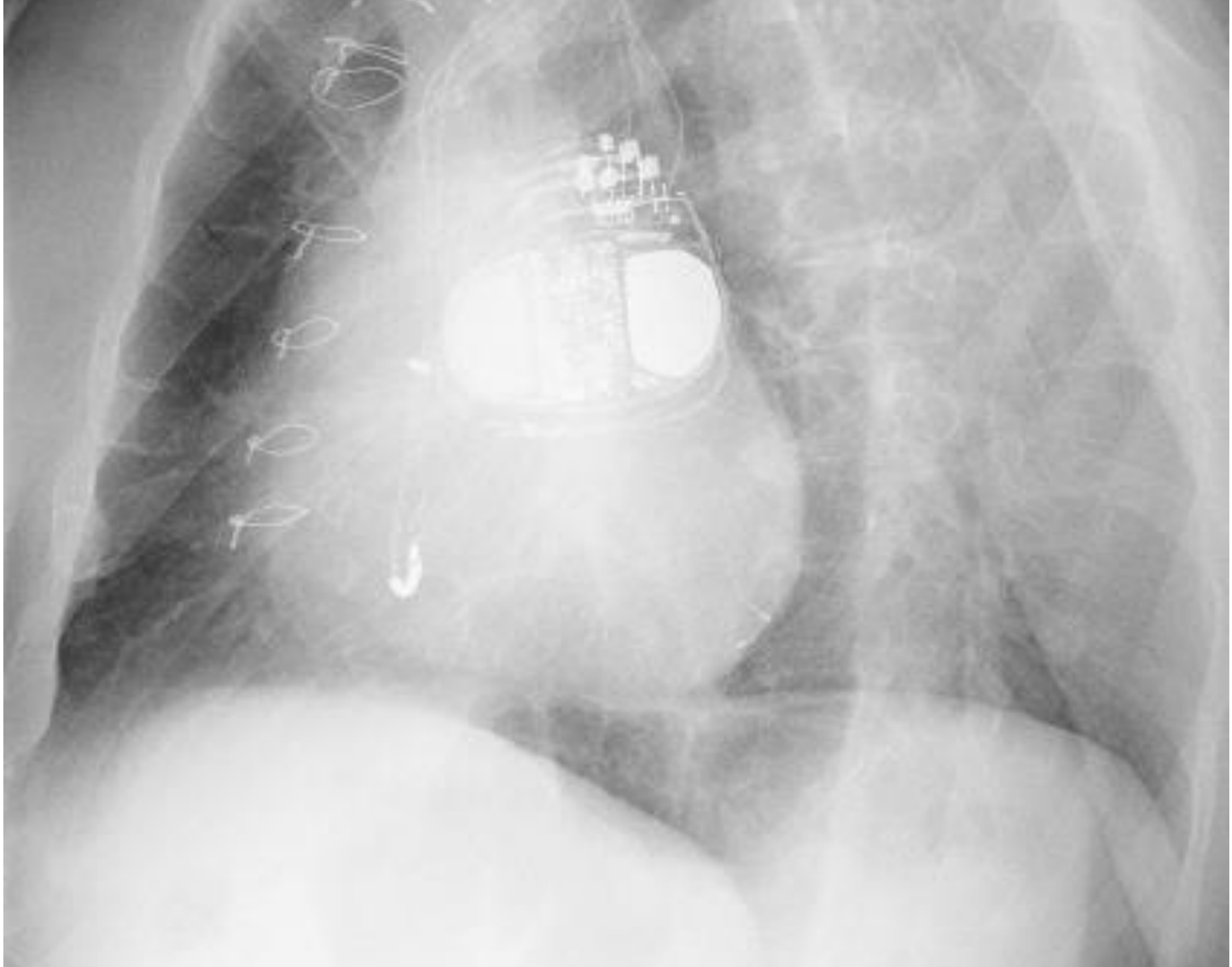
- Single chamber ICD upgraded to CRT-D device due to worsening of clinical status
- Implanted with a PARADYM RF SonR CRT-D on 27/04/2012 (A lead: Appendage, RV lead: Septum, LV lead: Posterior vein)
- SonR optimization set to AUTO

ECG at patient admission

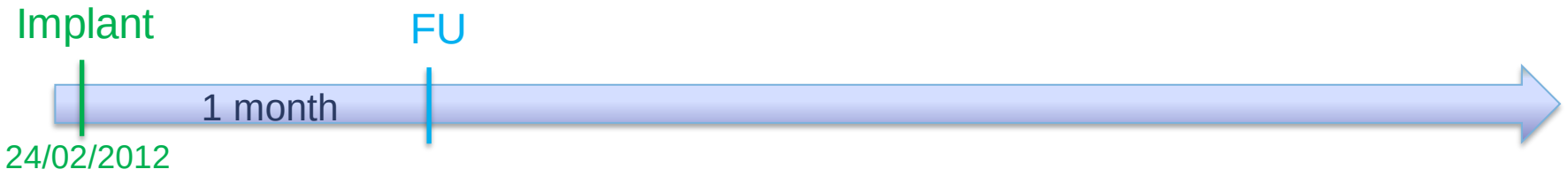
QRS=170ms







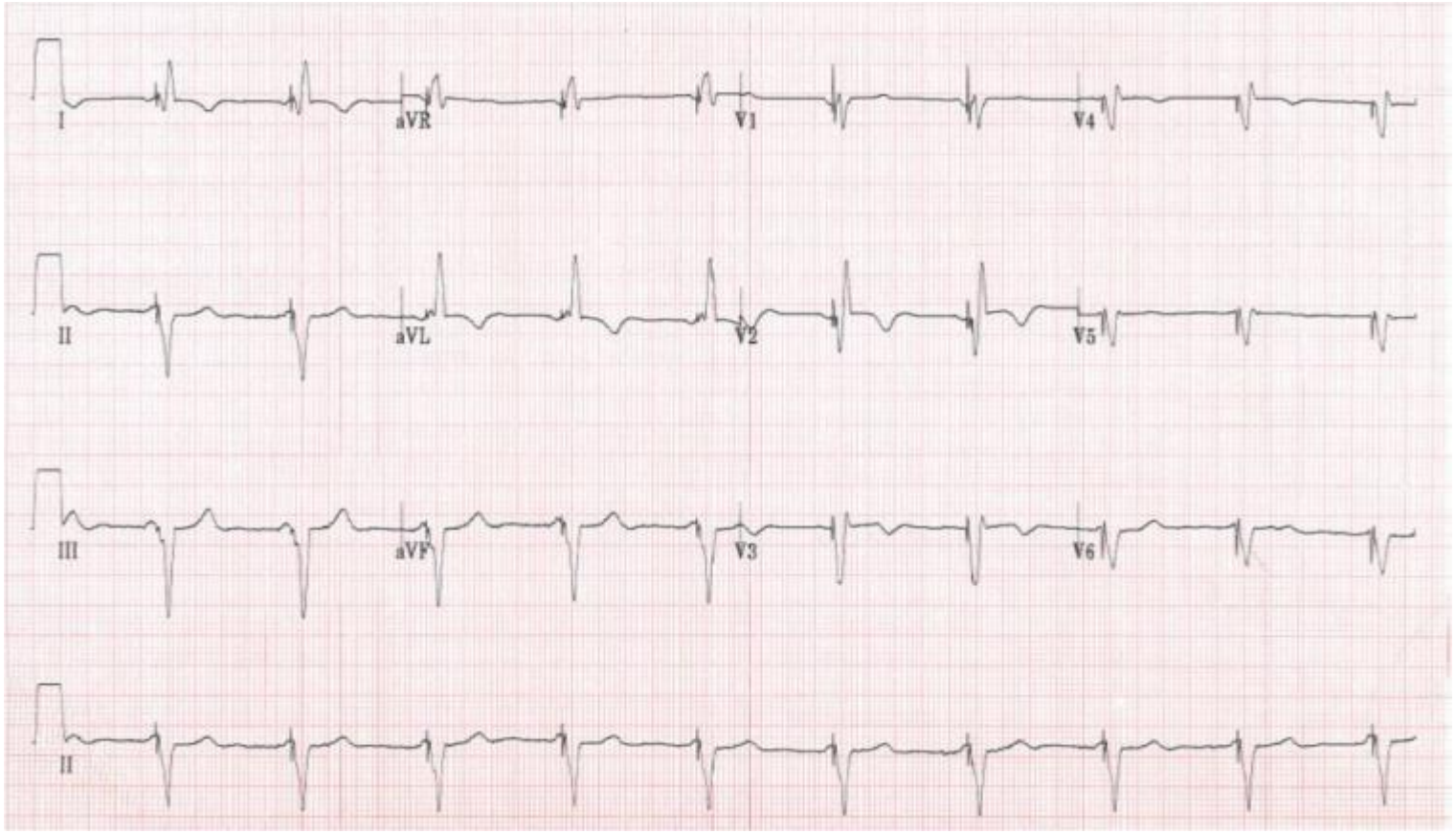
1-month follow-up



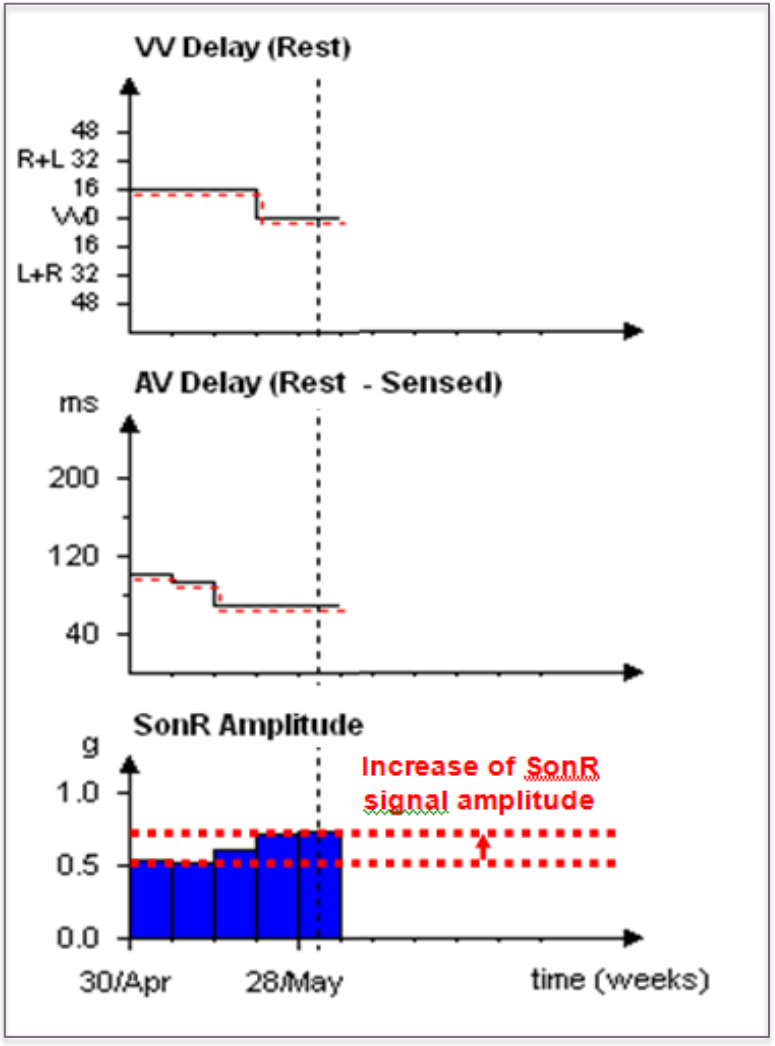
- **Patient became asymptomatic : NYHA class I**
- **Paced QRS: 120ms**

ECG at 1-month follow-up

QRS=120ms



SonR signal amplitude early improvement after CRT-D implantation

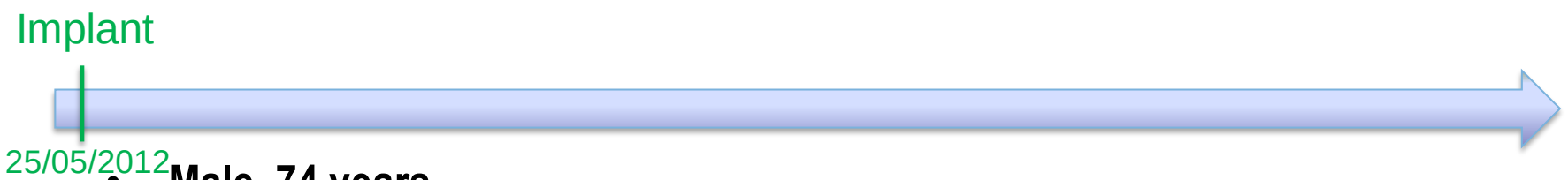


Lessons learned

- **Fast CRT effect on functional status (NYHA class III to class I within 1 month)**
- **Correlated with a marked improvement in SonR amplitude**
- **Automatic AVD/VVD adjustment ⇨ could both contribute to and be a consequence of patient improvement**

Case 2

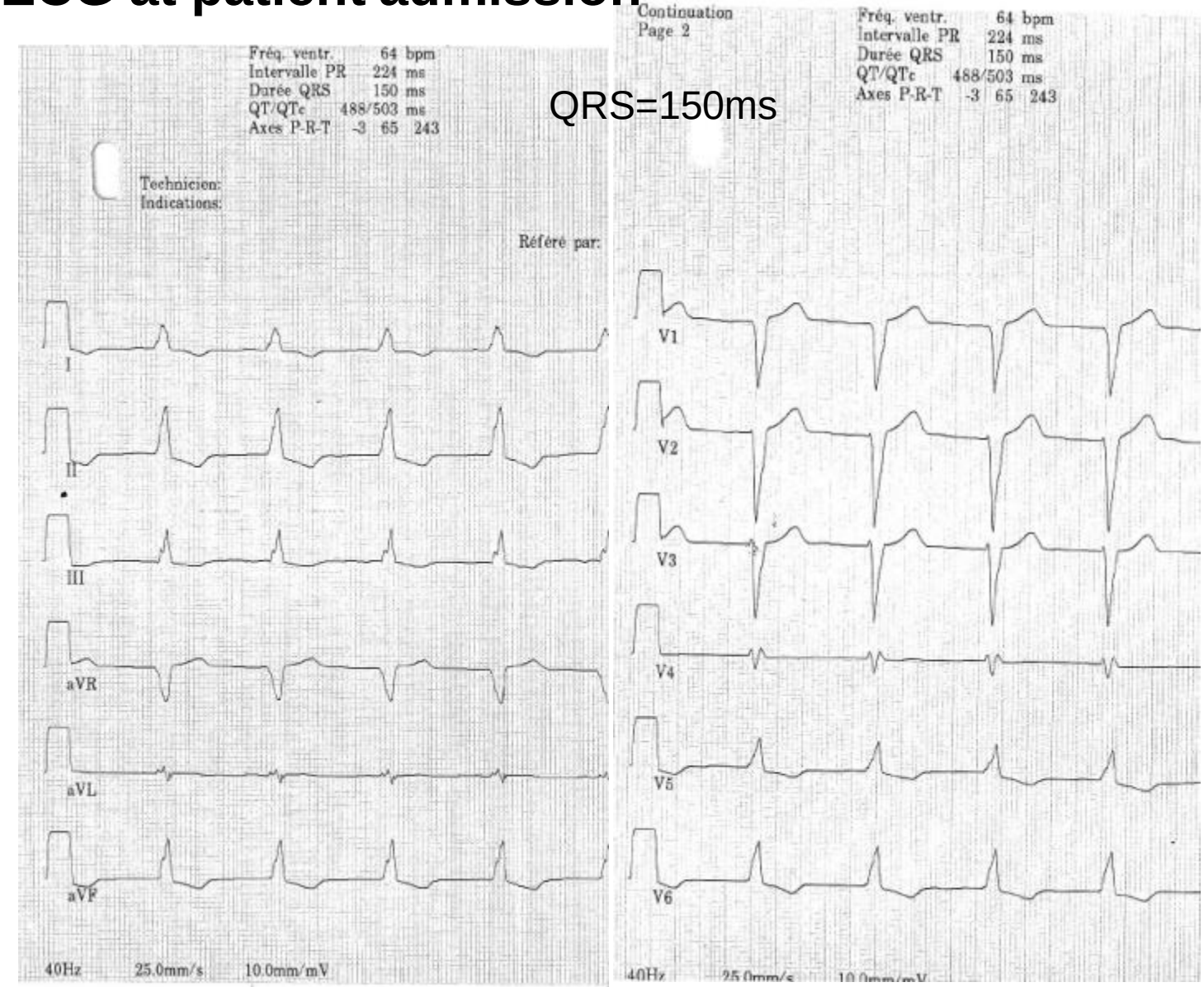
Patient Clinical History



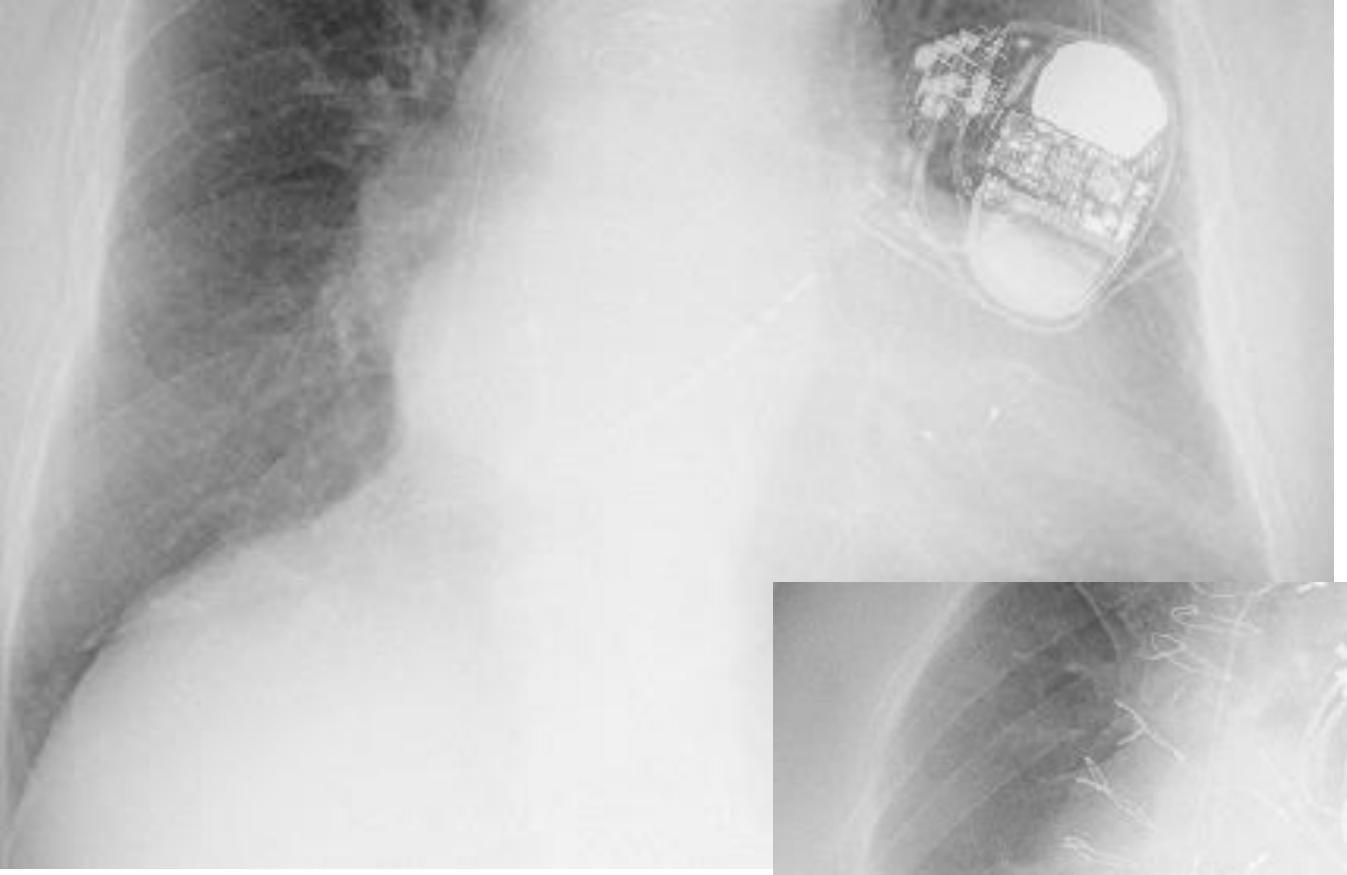
- **Male, 74 years**
- **Ischemic cardiomyopathy since 1993 (⇨ triple bypass)**
- 2005:
  - HF induced by AF; SR was restored with amiodarone
  - LVEF=12 %
  - DCM, LBBB
  - Asymptomatic patient ⇨ prophylactic single chamber ICD
- 2012
  - NYHA class III
  - LVEF=20%
  - Functional status worsening + broken Fidelis lead ⇨ CRT-D

- **Implanted with a PARADYM RF SonR CRT-D on 25/05/2012**
- **SonR optimization set to AUTO**

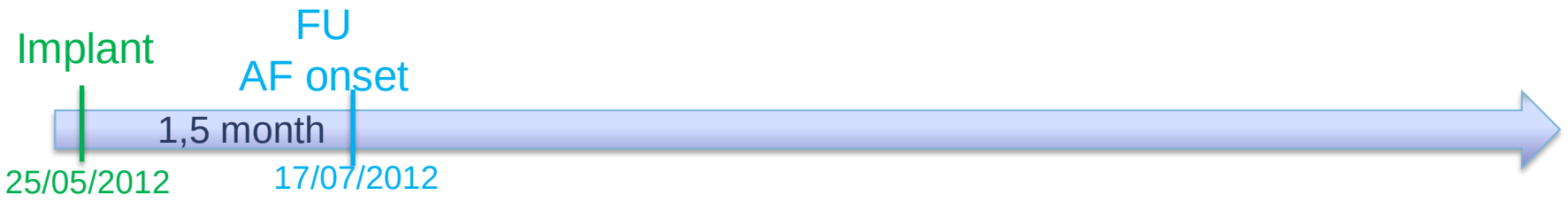
ECG at patient admission



QRS=150ms



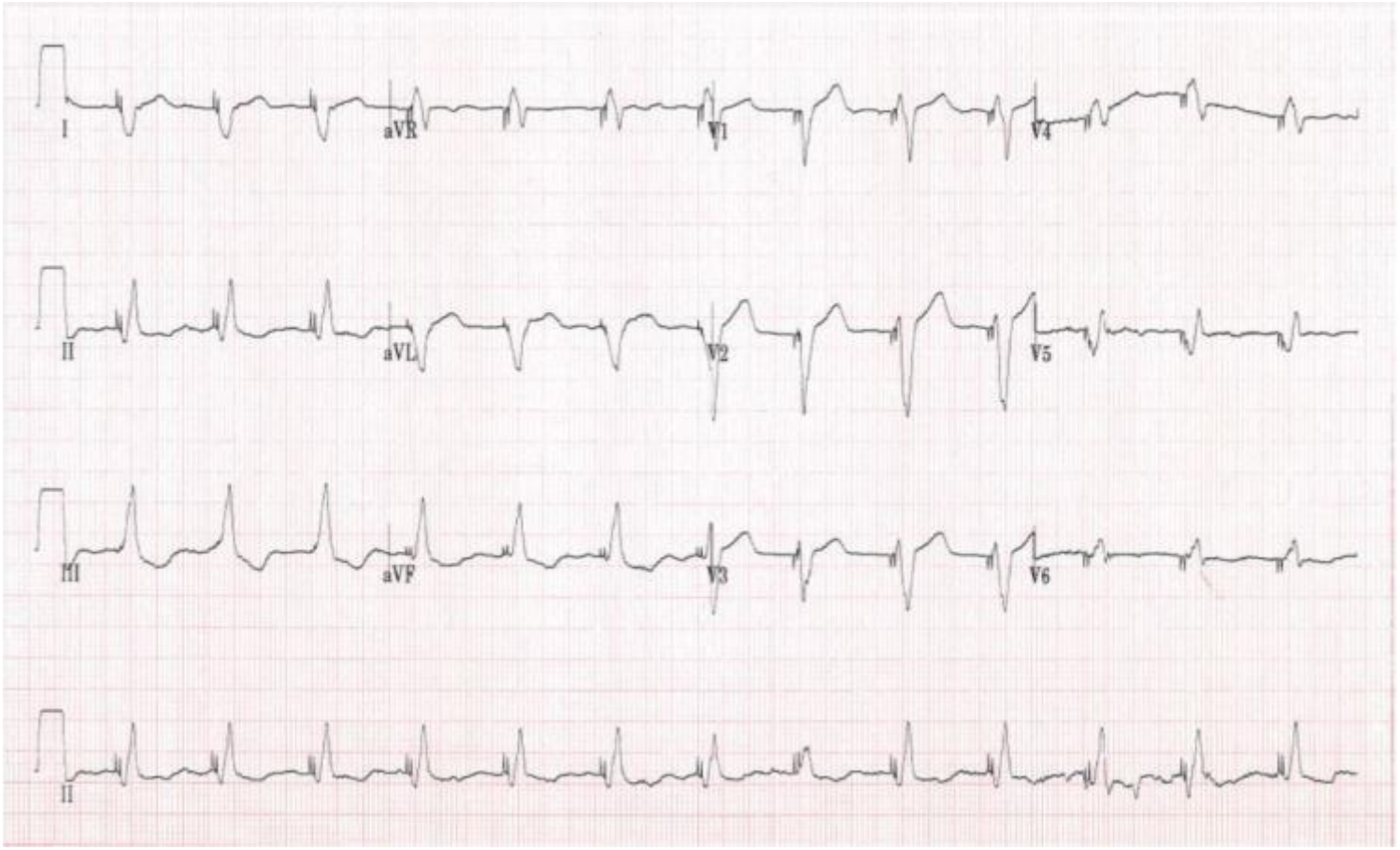
1-month follow-up: onset of AF



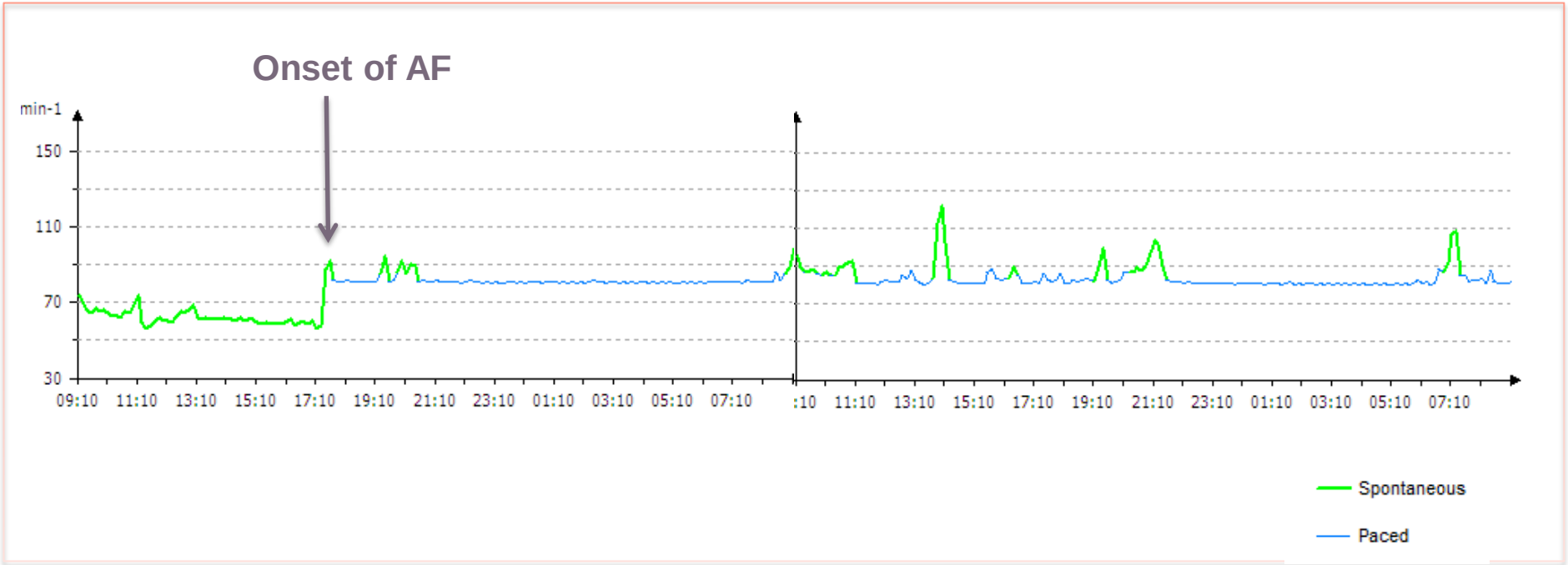
July 17th ,2012

- **NYHA class I**
- **AF started the day before the follow-up visit without symptoms**
- **More than 90% BiV pacing thanks to fallback rate set to 80bpm ⇨ no programming changes**

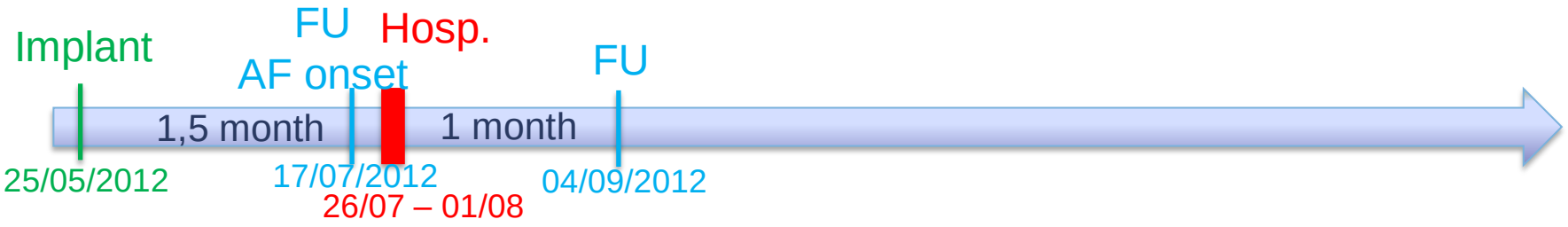
ECG at 1-month follow-up



HR over the last 48h



Hospitalization for HF



July 26th - August 1st ,2012

- **Few days after the onset of AF, hospitalization for dyspnea**
- **Patient still in AF with reduced BiV pacing at only 80%**
- **Patient treated with diuretics**

September 4th ,2012

- **In clinic follow-up to check patient status**
- **Patient still in AF with dyspnea**
- **Sensor activation to increase heart rate to reduce dyspnea**
- **Cardioversion planned one month later**

Sinus rhythm restoration

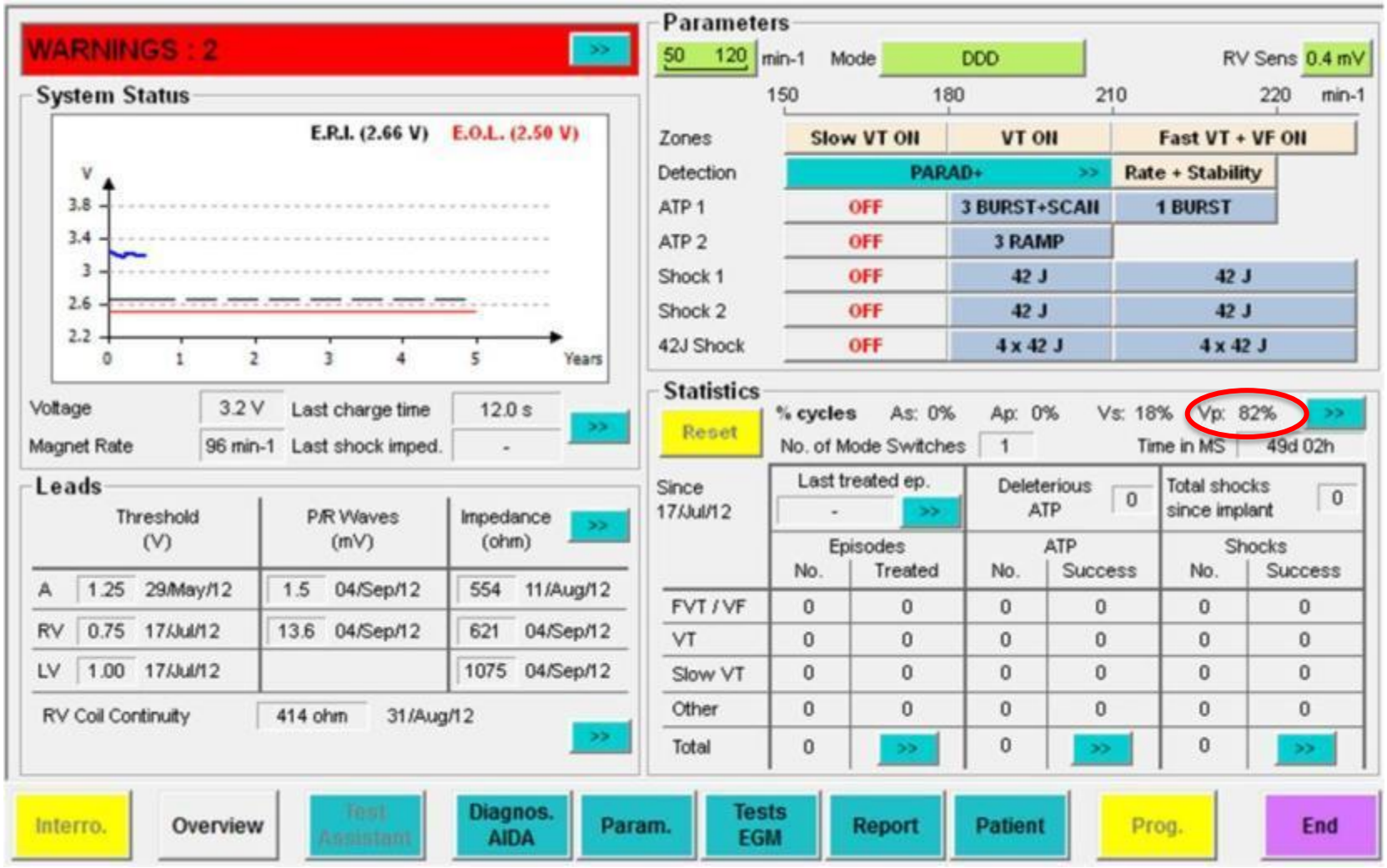
October 10th ,2012

- **Successful cardioversion**

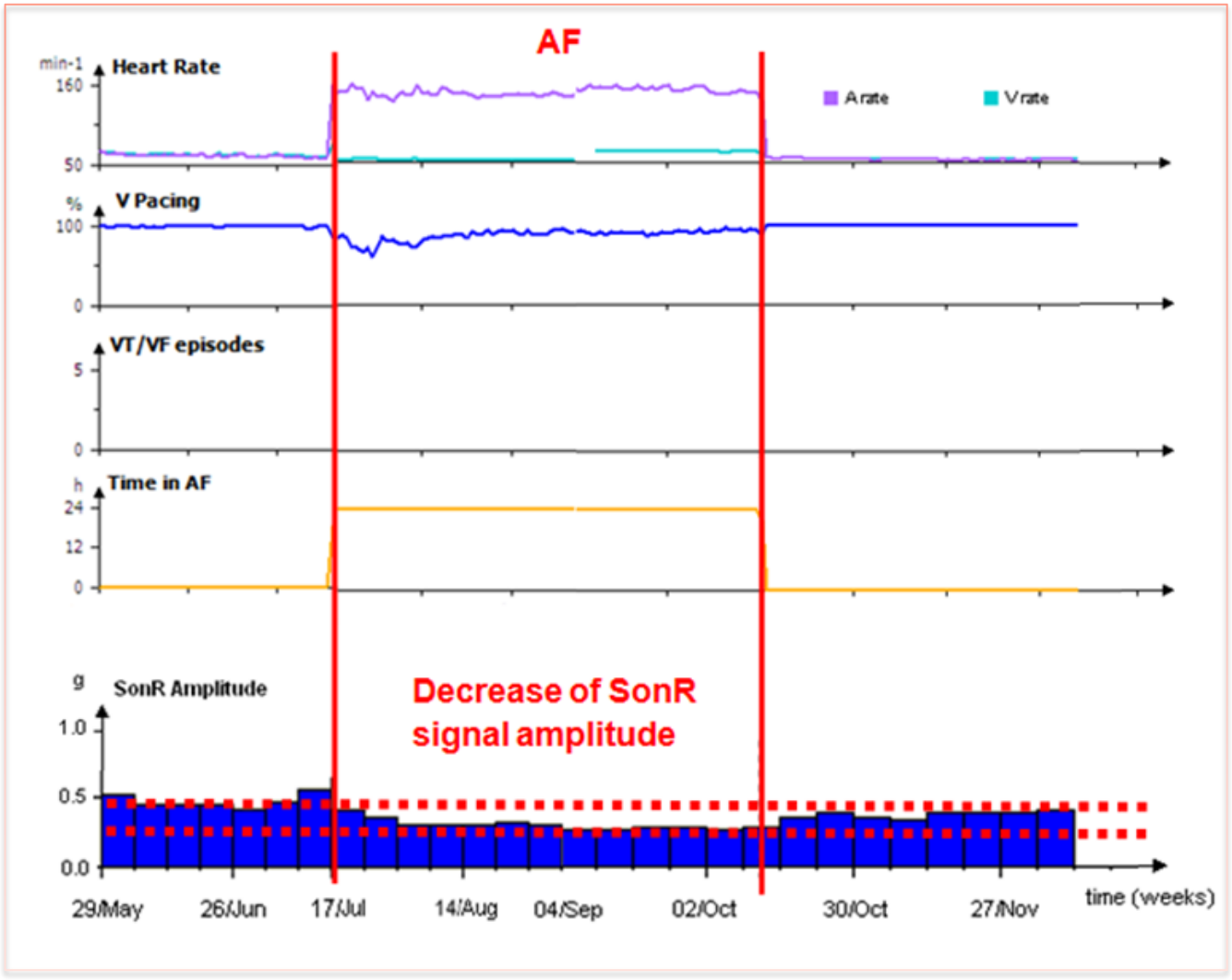
December 11st ,2012

- **In clinic follow-up to check patient status**
- **Patient in sinus rhythm**
- **Functional status improvement**

CRT-D interrogation



SonR signal amplitude evolution in presence of AF and after sinus rhythm restoration



Lessons learned

- The programming of fallback rate at 80 bpm allowed a reasonably high percentage of BiV pacing (100% to 80%)
- Gradual worsening of functional status induced by AF and followed by a HF hospitalization
- Correlated with a gradual SonR amplitude decrease, along with worsening symptoms; stable after patient stabilization
- Gradual improvement of functional status after sinus rhythm restoration correlated with a gradual SonR amplitude increase

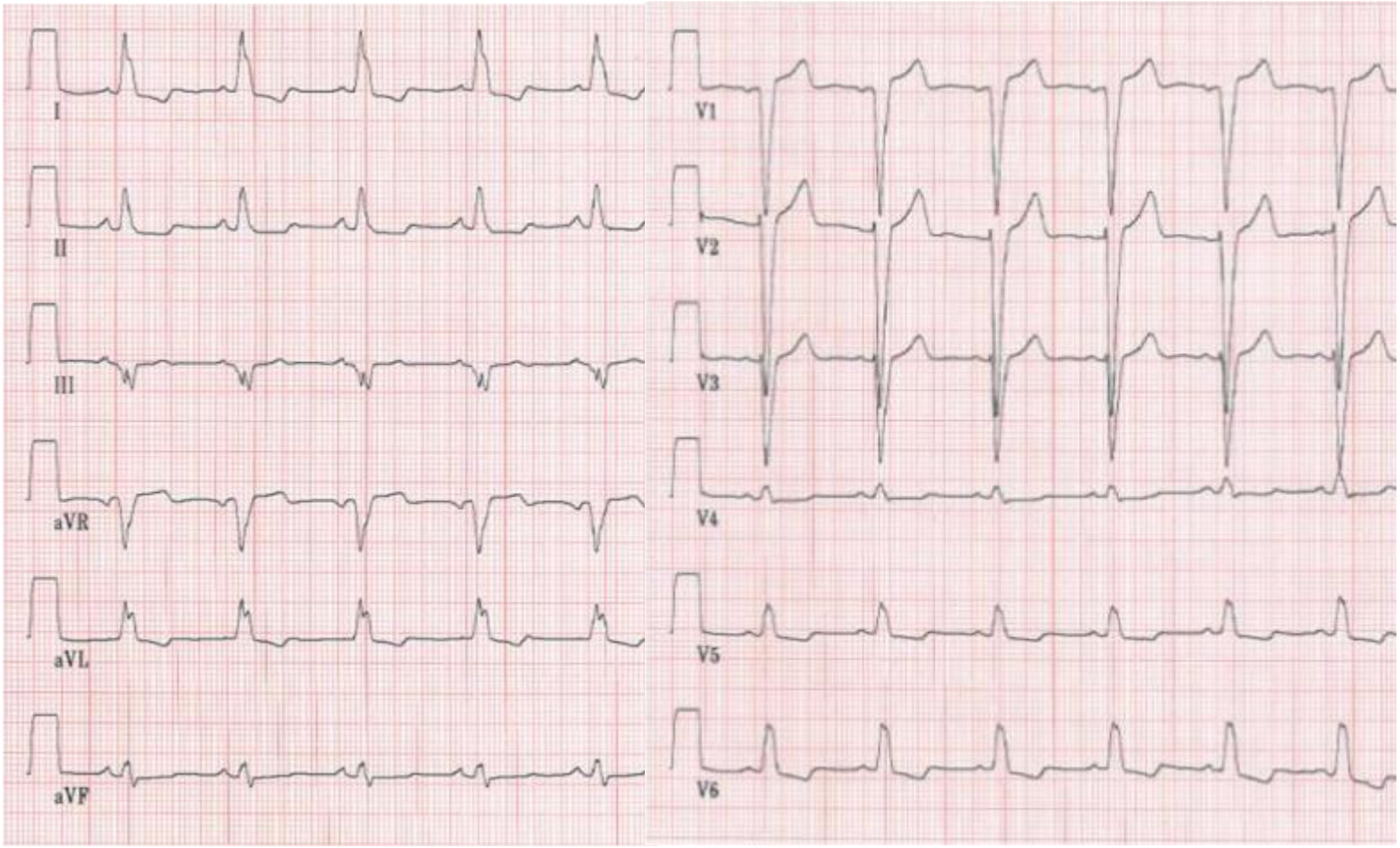
Case 3

Patient Clinical History

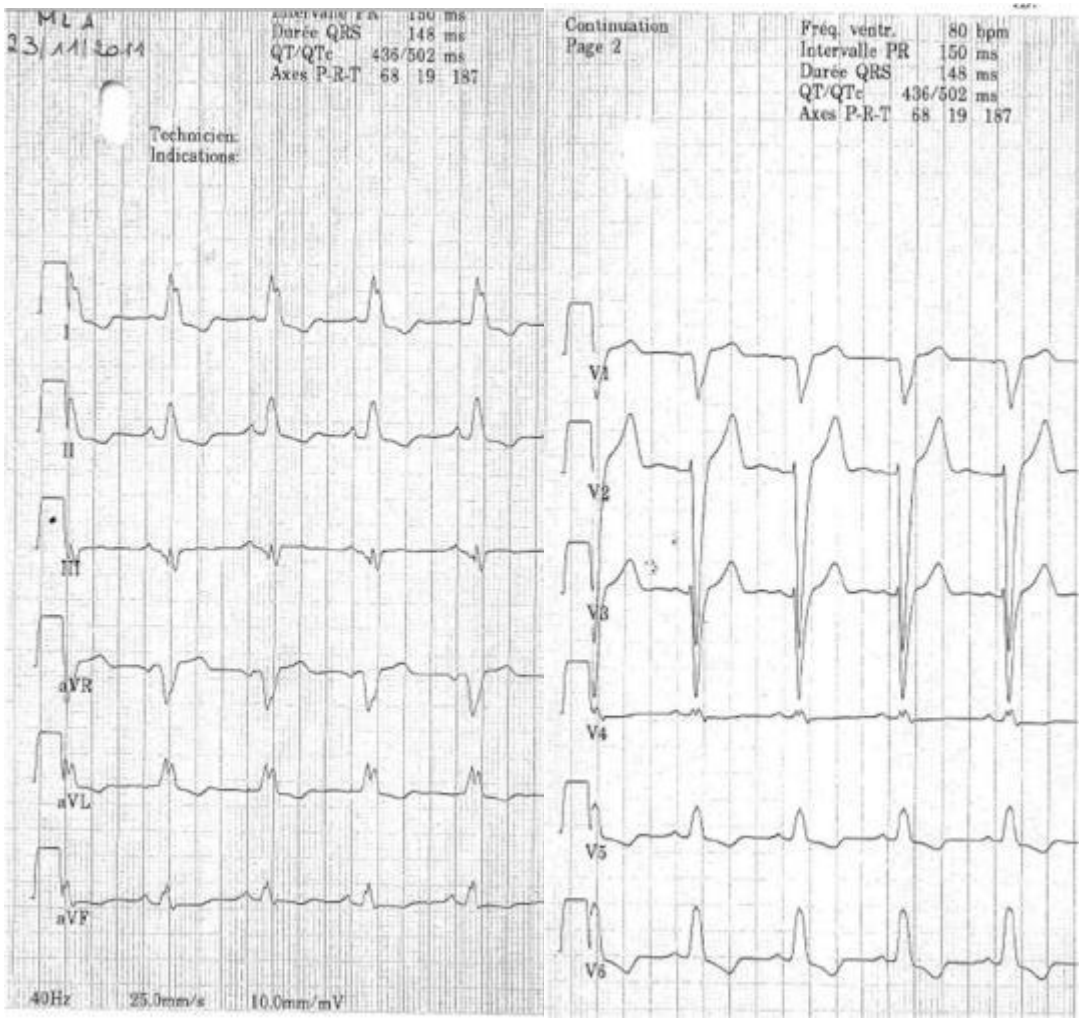
- **Female, 65 years old**
- **DCM related to radiotherapy and chemotherapy (left side breast cancer treated in 2007), LBBB**
- **NYHA class III**
- **LVEF 35%**

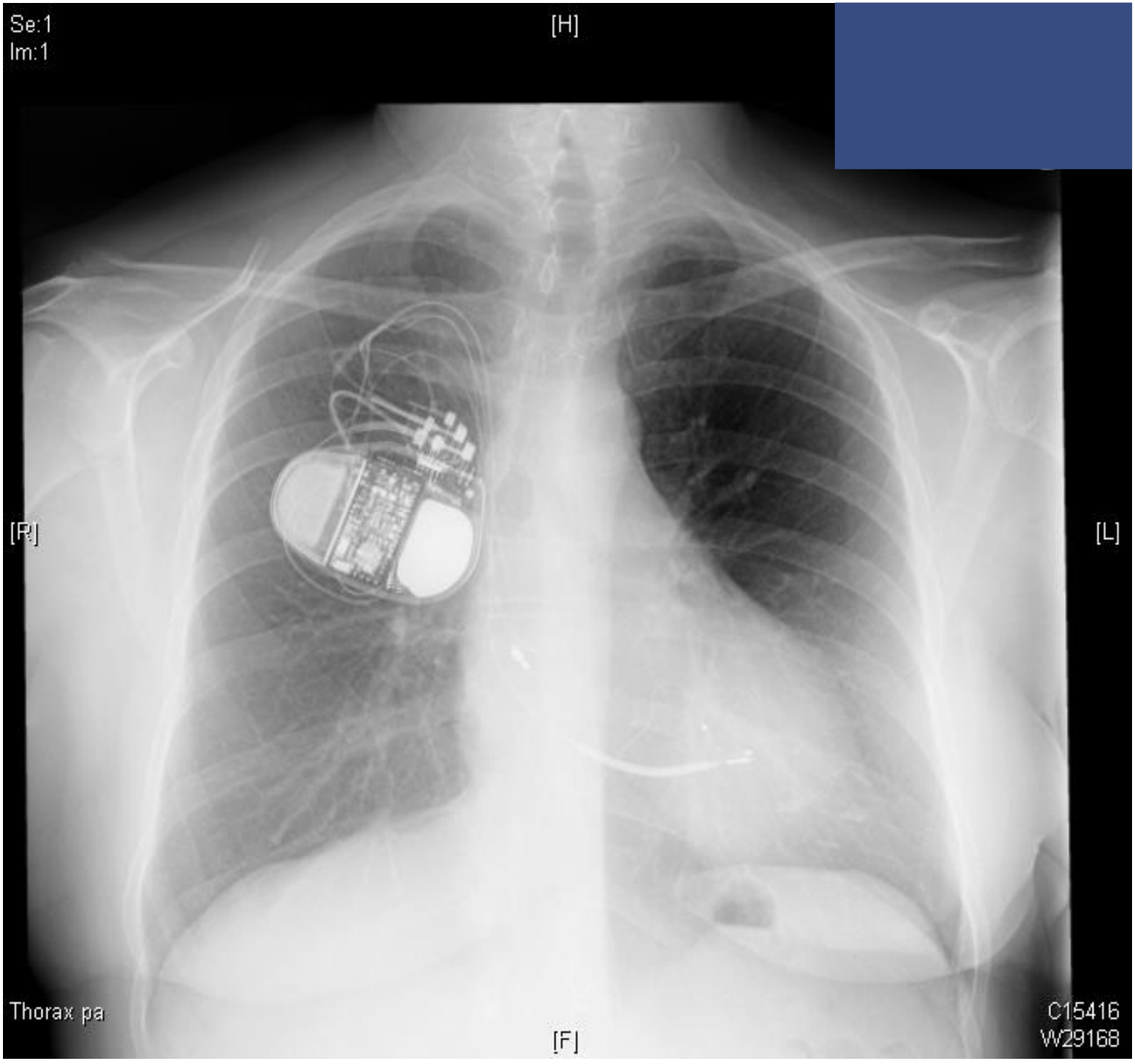
- **Implanted with a PARADYM RF SonR CRT-D on 11/11/2011 with LV implantation failure**
  - **SafeR mode was programmed until the second LV implantation attempt to prevent ventricular pacing**
- **LV lead successfully implanted on 01/02/2012**
  - **SonR optimization set to AUTO**

ECG at patient admission



ECG at patient discharge
(LV lead implantation failure)

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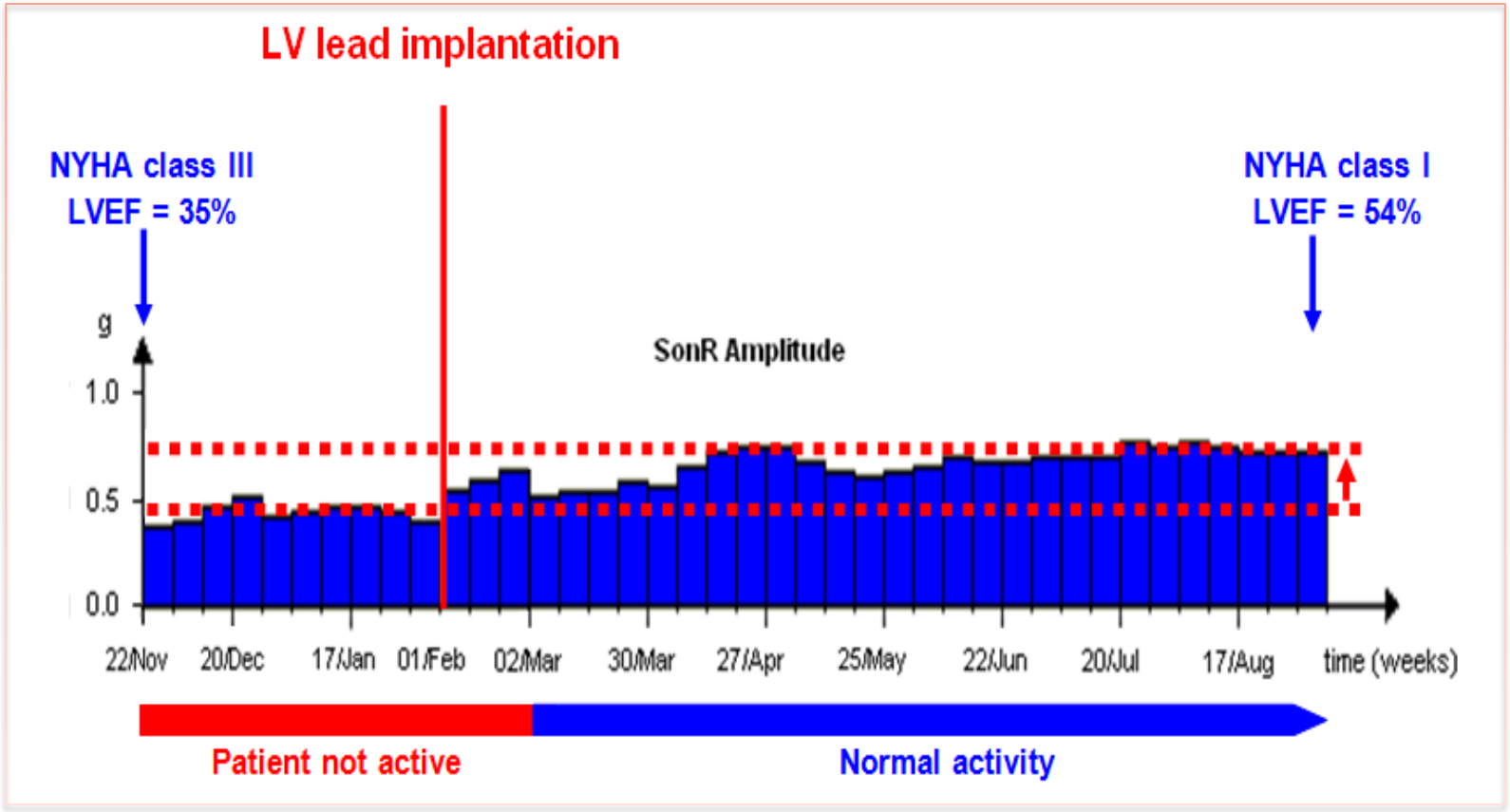
6-months follow-up:
functional and echo status improvement

September 4th ,2012

- **Marked functional status improvement: NYHA class I**
  - **The patient resumes activities**
- **Marked LVEF improvement: 54%**

SonR signal amplitude evolution before and after CRT-D pacing

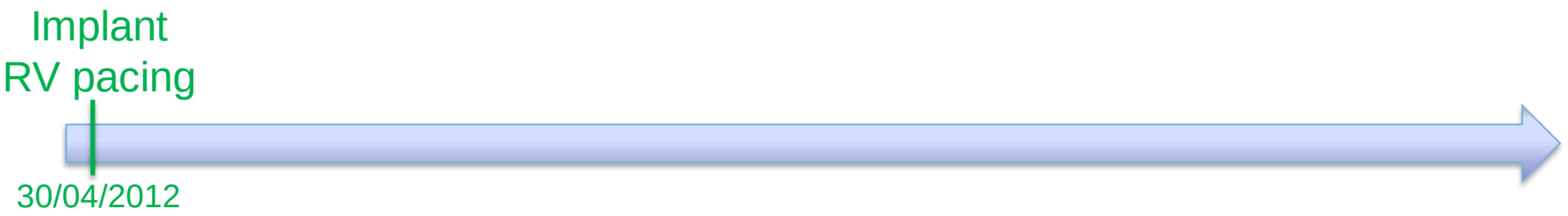


Lessons learned

- Functional status improvement and LVEF increase
- Correlated with SonR amplitude increase

Case 4

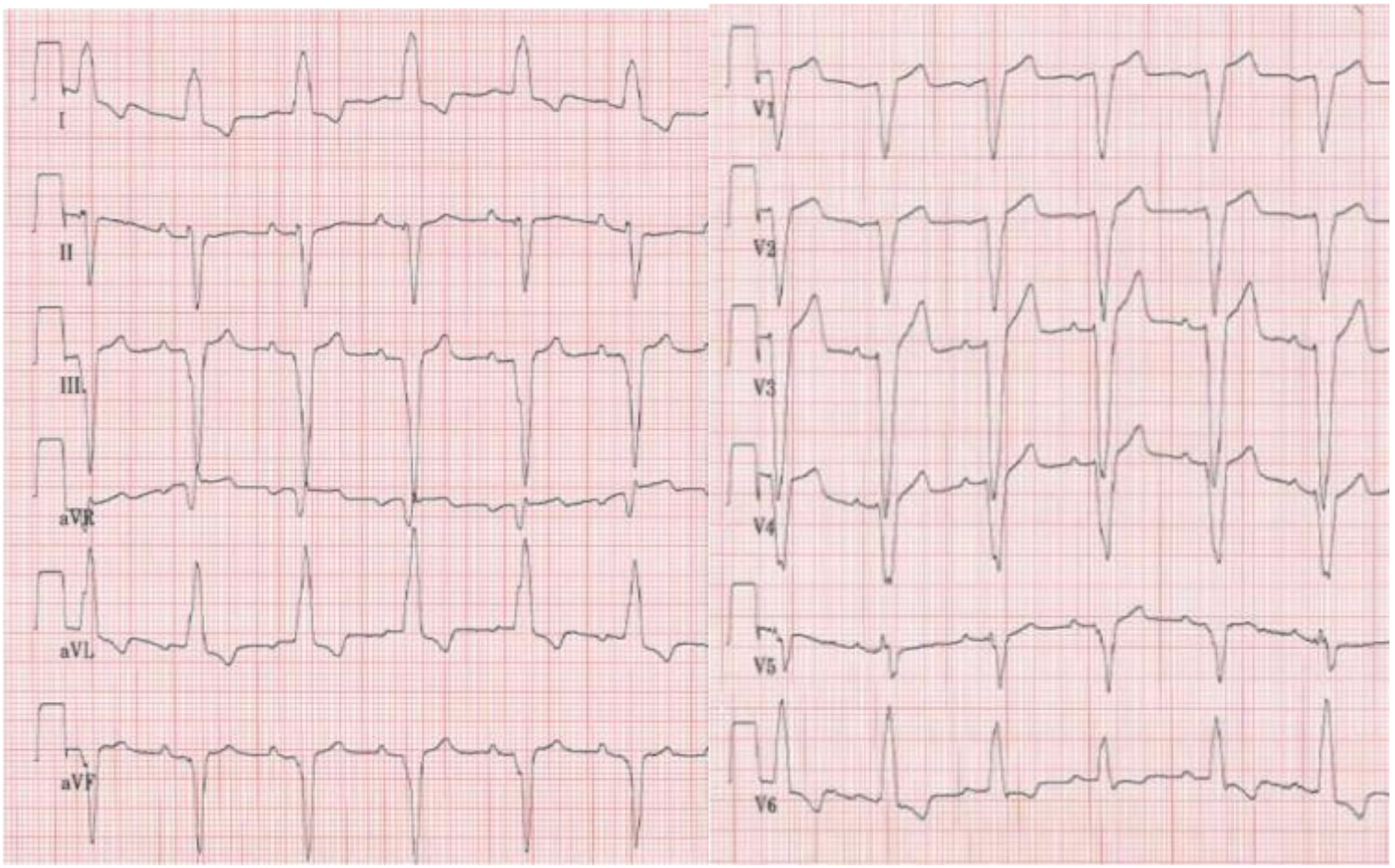
Patient Clinical History



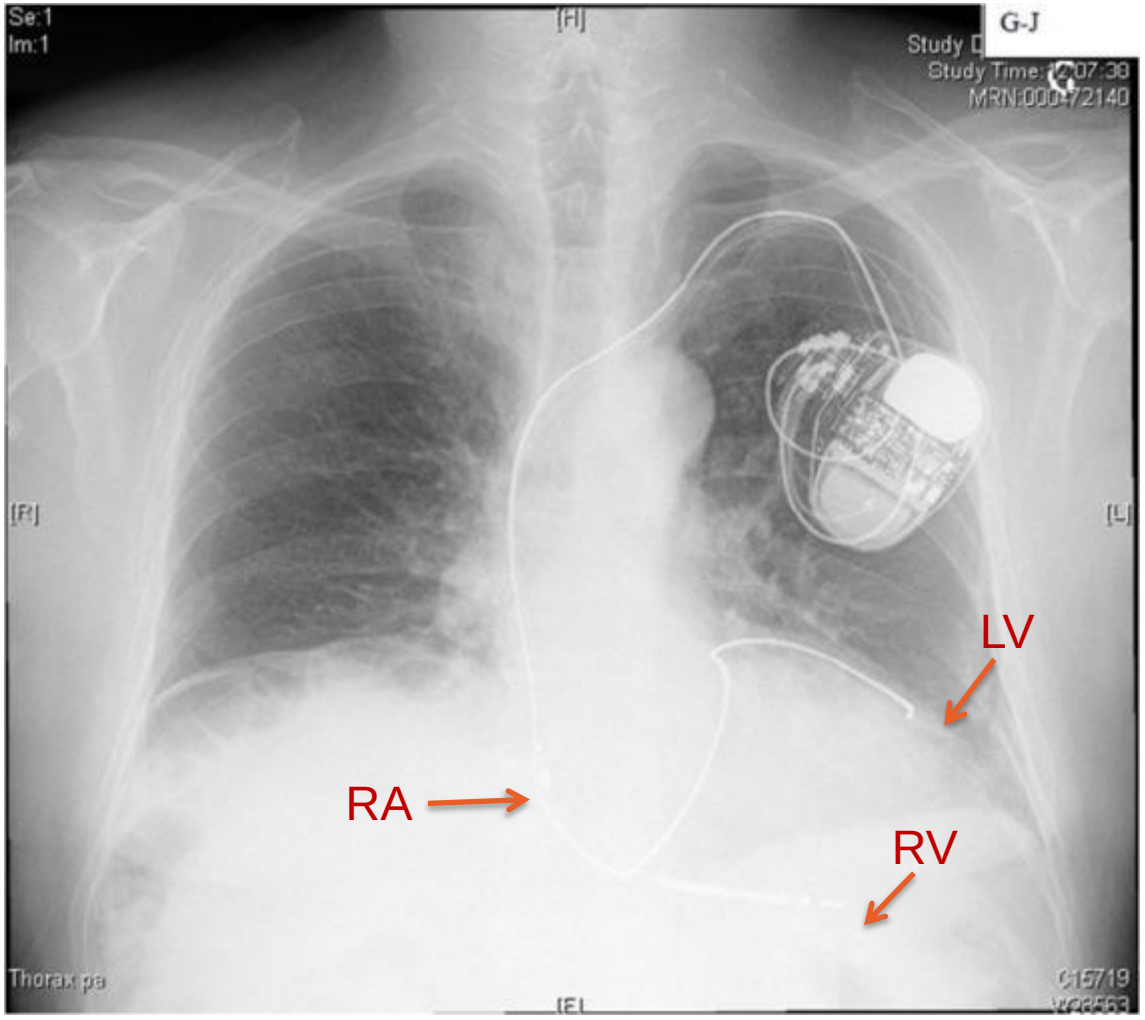
- **Male, 79 years old**
- **DCM, LBBB**
- **QRS=170ms**
- **NYHA class III**
- **LVEF 30%**

- **Implanted with a PARADYM RF SonR CRT-D on 30/04/2012 with diaphragmatic stimulation ⇨ RV pacing only**

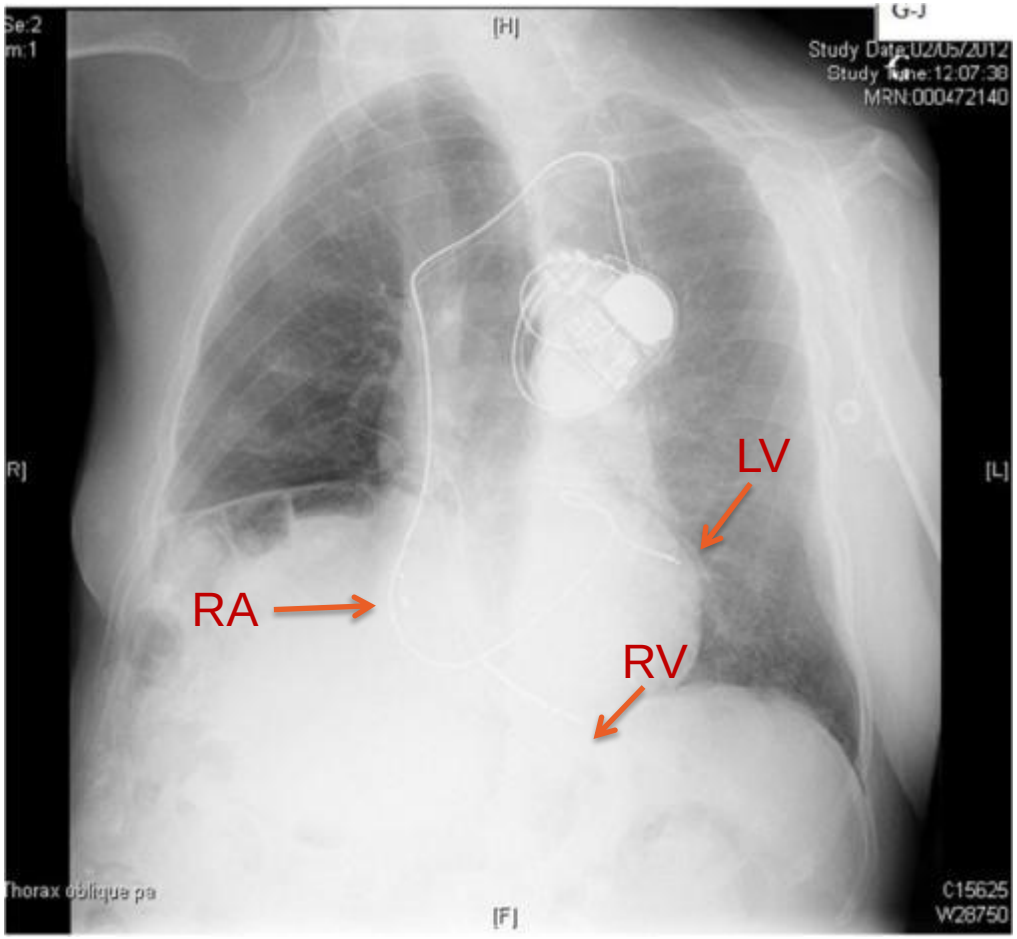
ECG at patient admission



X-ray

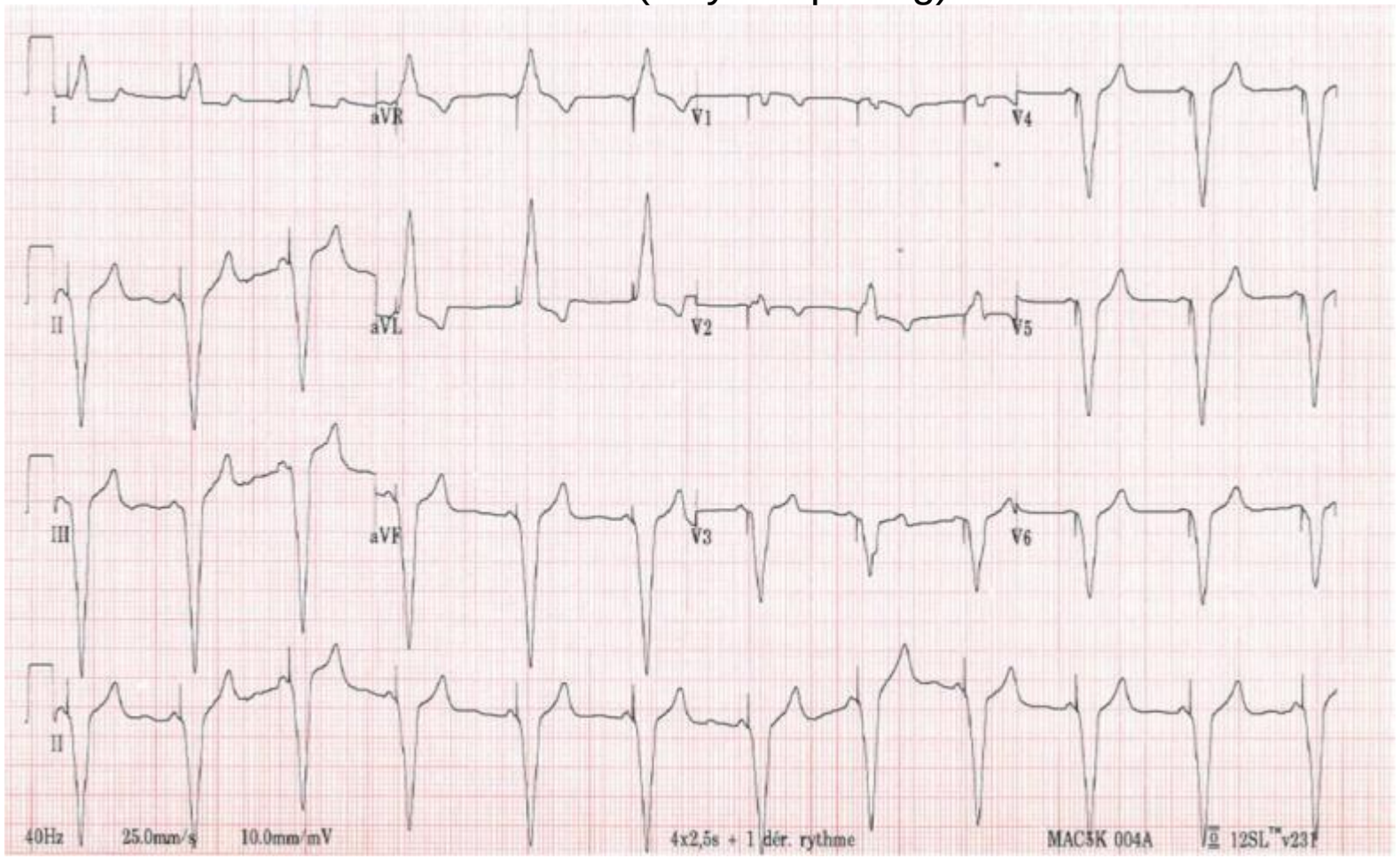


X-ray



ECG at patient discharge

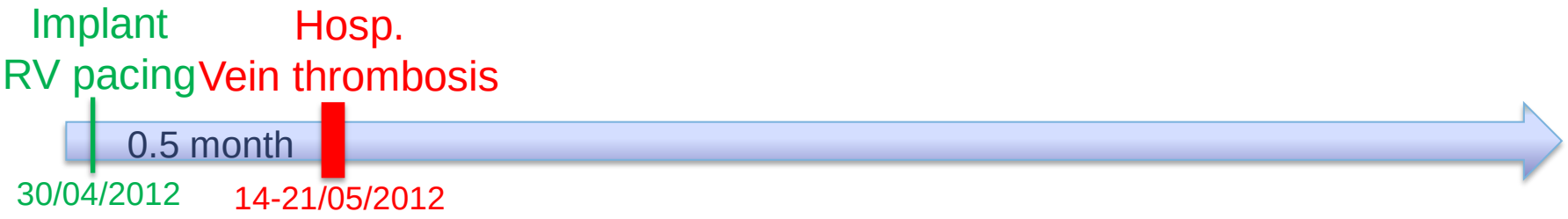
DDD mode (only RV pacing)



ECG at patient discharge

- **ECG suggests a delayed right ventricular activation, and x-ray may suggest that the RV lead is in a posterior vein ⇨ DDD with RV pacing only is maintained.**
  - **SonR optimization set to AVD AUTO**
- **LV lead repositioning depending on patient status**

Hospitalization for vein thrombosis

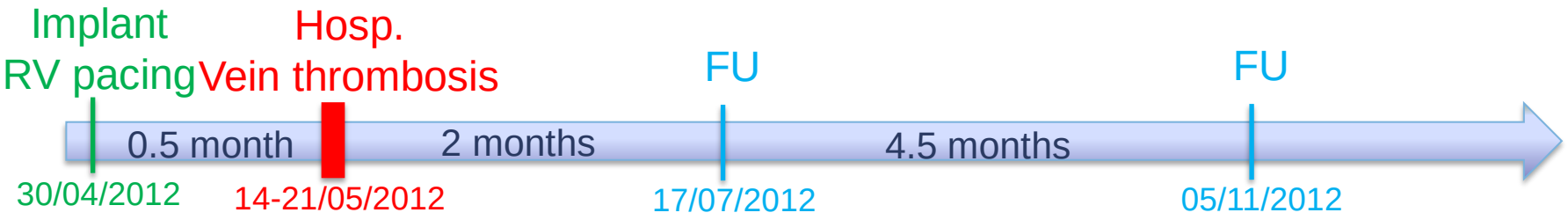


May14th – 21th,2012

- **Left arm vein thrombosis**

- **Echo in DDD (RV stimulation only):**
  - **Interventricular asynchrony still present at 63ms**
  - **Moderate intraventricular asynchrony**
  - **LVEF = 31% (stable)**

Follow-ups



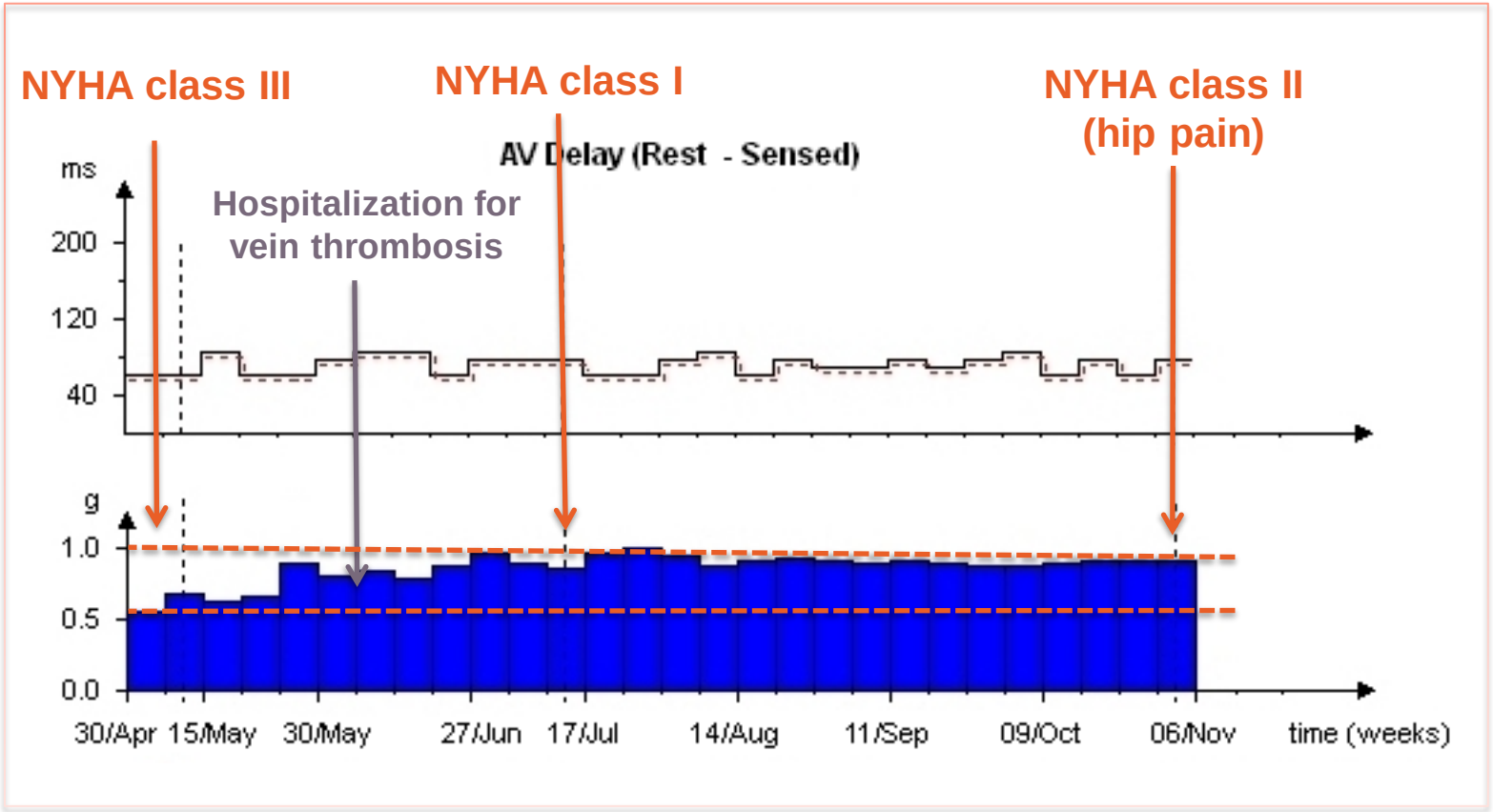
July 17th,2012

- **100% RV stimulation**
- **SonR automatic AVD optimization**
- **NYHA class I: functional improvement despite the absence of LV stimulation; the patient is only bothered by pain in his hips**

November 5th,2012

- **100% RV stimulation**
- **SonR automatic AVD optimization**
- **NYHA class II due to hip pain (surgery planned)**

Functional status improvement with RV pacing only



Lessons learned

- **Functional status improvement despite the absence of LV pacing (100% RV pacing only with SonR AVD optimization)**

- **Correlated with SonR amplitude increase**