

Ask Yourself

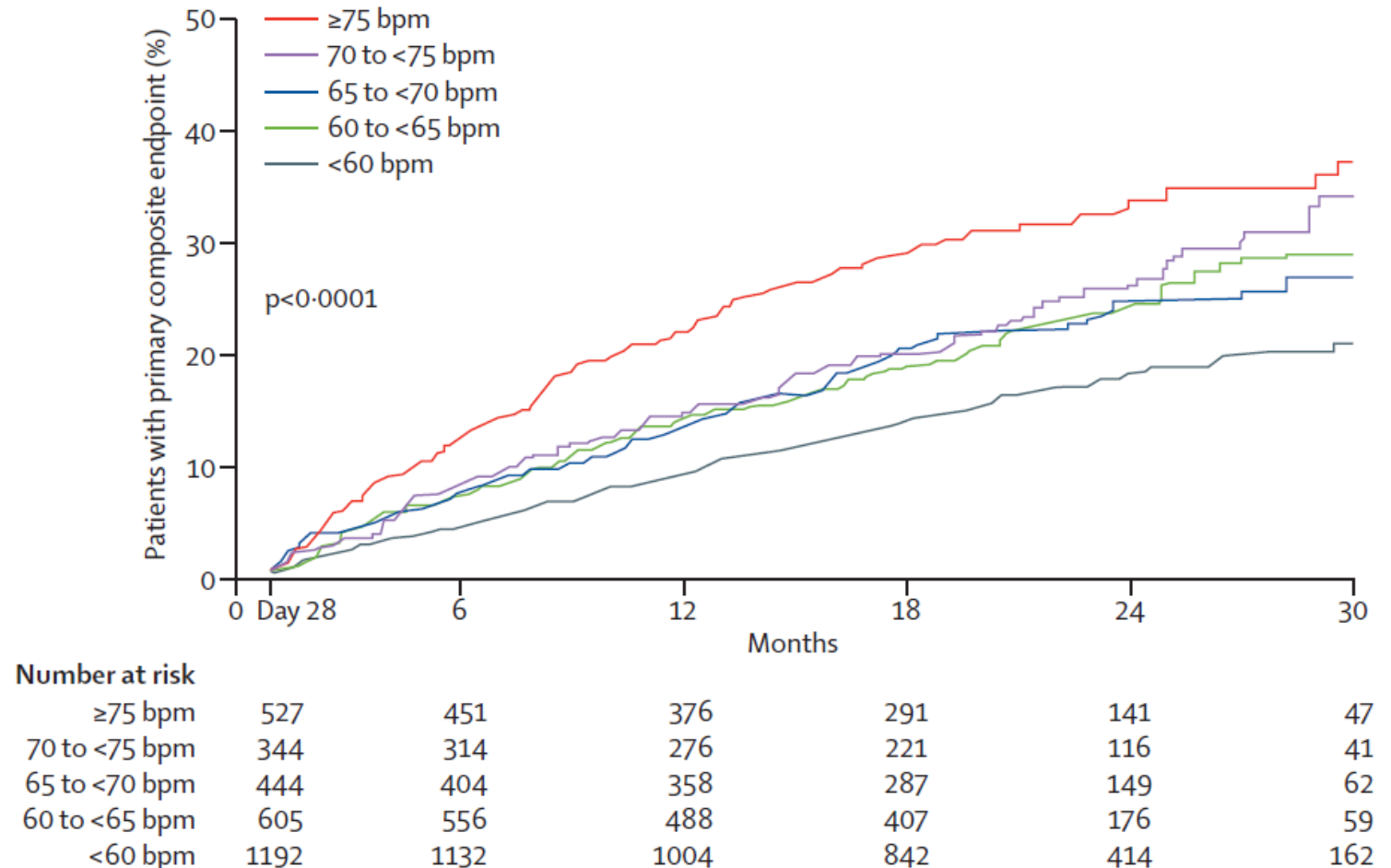
Is there evidence for atrial
stimulation in Heart
Failure ?



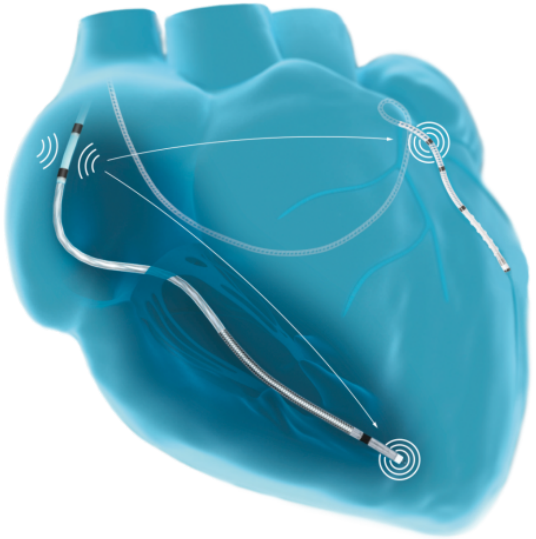
Heart Rate lowering in heart failure due to Systolic Dysfunction

SHIFT: 6,505 patients with heart failure and EF $\leq$ 35% with resting heart rate $\geq$ 70 beats/min in sinus rhythm, randomized to placebo or ivabradine

- In the ivabradine group, there was a direct association between heart rate achieved at 28 days and cardiac outcome
- The heart rate reduction, not drug dosage, impacted on survival
- The heart rate is the target of heart failure treatment.



Benefit of a low resting HR in HF patients



- **HR reduction Decreases Mortality in HF**
- Mortality Risk decreases **by 18%²** (CI 95%: 6-29%) every 5 bpm reduction in HF patients
- **HR achieved** more important than Beta-Blocker dosage³⁻⁴

1. Waagstein F, Hjalmarson A, Swedberg K, Wallentin I. Beta-blockers in dilated cardiomyopathies: they work. Eur Heart J 1983;4 suppl A: 173e178.

2. Kjekshus J, Gullestad L. Heart rate as a therapeutic target in heart failure. Eur Heart J Suppl 1999;1:64e69.

3. McAlister FA, Wiebe N, Ezekowitz JA, Leung AA, Armstrong PW. Meta-analysis: beta-blocker dose, heart rate reduction, and death in patients with heart failure. Ann Intern Med 2009;150:784e794.

4. Cullington D, Goode KM, Clark AL, Cleland JG. Heart rate achieved or beta-blocker dose in patients with chronic heart failure: which is the better target? Eur J Heart Fail 2012;14:737e747

Stimulation to Enable β -blockers Up-Titration ?



European Heart Journal (2016) 37, 2129–2200
doi:10.1093/eurheartj/ehw128

ESC GUIDELINES



2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

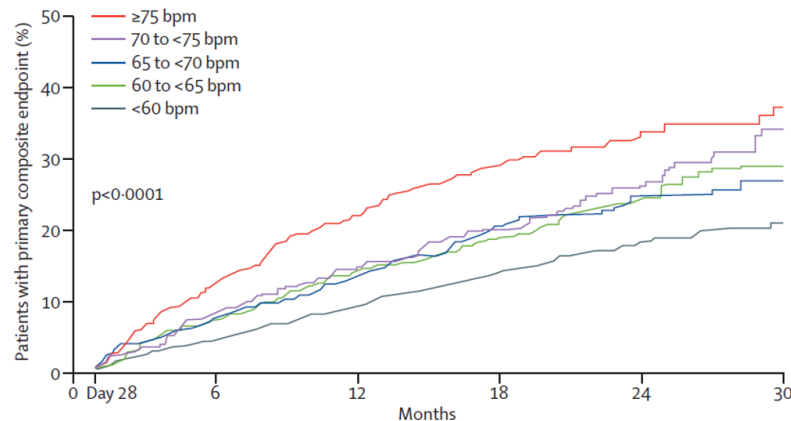
The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)



Recommendations for the management of bradyarrhythmias in heart failure

Recommendations	Class ^a	Level ^b	Ref ^c
When pauses >3 seconds are identified on the ECG, or if the bradycardia is symptomatic and the resting ventricular rate is <50 bpm in sinus rhythm or <60 bpm in AF, it should be considered whether there is need for any rate limiting medications prescribed; for patients in sinus rhythm beta-blockers should be reduced in dose or withdrawn only as a last resort.	IIa	C	
For patients with symptomatic, prolonged or frequent pauses despite adjustment of rate limiting medication, either beta-blocker withdrawal or pacing may be considered as the next step.	IIb	C	
Pacing solely to permit initiation or titration of beta-blocker therapy in the absence of a conventional pacing indication is not recommended.	III	C	
In patients with HFrEF who require pacing and who have high degree AV block, CRT rather than RV pacing is recommended.	I	A	274, 275, 290
In patients with HFrEF who require pacing who do not have high degree AV block, pacing modes that avoid inducing or exacerbating ventricular dyssynchrony should be considered.	IIa	C	

Why do you want atrial pacing when slowing the heart rate is beneficial ?



2012 EHRA/HRS expert consensus statement on cardiac resynchronization therapy in heart failure: implant and follow-up recommendations and management

Where we started
from

At early device programming, attention and focus on pacing mode, pacing rate, and intervals are important. In patients with sinus rhythm, a VDD/DDD pacing mode without rate responsiveness (i.e. at least as first intent) is recommended. The large CRT studies were performed in VDD mode programming at a low basic rate, 35–40 b.p.m., to ensure permanent or nearly permanent atrial sensing and to avoid the confounding influences of atrial support.^{210,211} An important objective of heart failure medical treatment is to lower the atrial rate at the lowest tolerated value >50 b.p.m.⁵ Regarding the upper rate limit, it is reasonable to consider programming a rate that is 80% of the maximal age-predicted heart rate. Programming a low maximal tracking rate in a patient with intrinsic conduction may lead to a high risk of symptomatic loss of biventricular capture during exercise.

The first published experience with the CRT-DX system: 2013 - 2017



- 37 patients, 66 (58–73) years old. Females 6/12 DX patients.
- 25 implanted with conventional 3-lead CRT-D system and 12 with CRT-DX.
- No difference in medical therapy. Lower RATE = 30 bpm in both groups. Atrial pacing < 1%
- 3 years minimum FU, there were no differences in terms of NYHA class, reverse remodeling, cardio-pulmonary test, presence of chronotropic incompetence.



Circulation

"The Role of Atrial Pacing Support in Cardiac Resynchronization Therapy: A Non-Inferiority Randomized Trial"

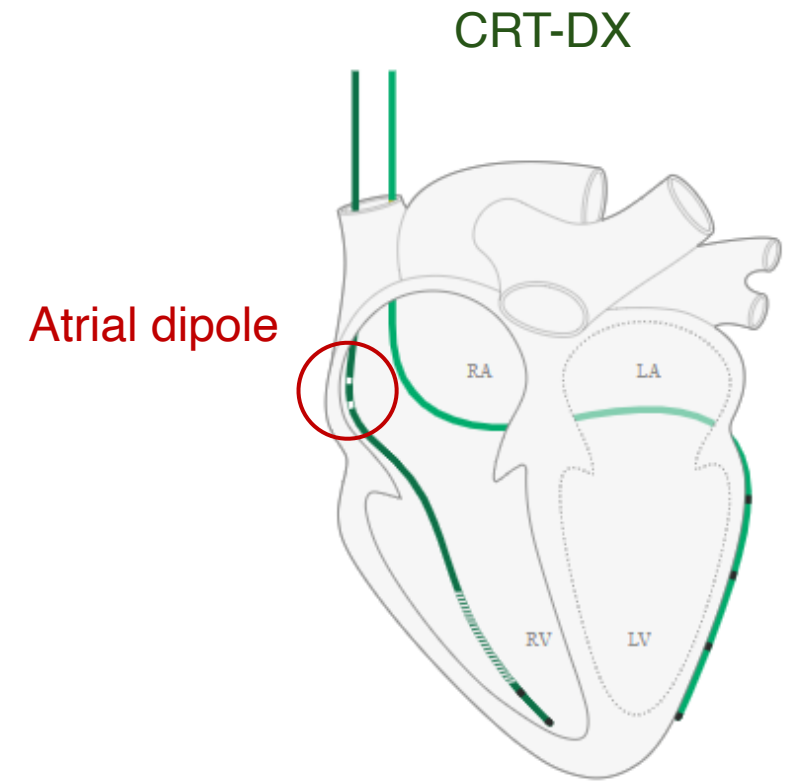
Mauro Biffi, Giovanni Rovaris, Ennio C.L. Pisanò, Valeria Calvi, Antonio Rapacciuolo, Matteo Santamaria, Giampiero Maglia, Gabriele Zano, Emanuele Bertaglia, Gerardo Nigro, Andrea Giomi, Francesca Notarangelo, Patrizia Pepi, Giuliano D'Alterio, Davide Castagno, Antonio Dello Russo, Antonino Nicosia, Massimo Zecchin, Matteo Bertini, Antonio Duca, Daniele Giacomelli, Alessio Gargaro, Giovanni Luca Botto on behalf of the CRT-NEXT study group

CIRCULATION. 2026; [PUBLISHED ONLINE AHEAD OF PRINT]. DOI: 10.1161/CIRCULATIONAHA.126.0798



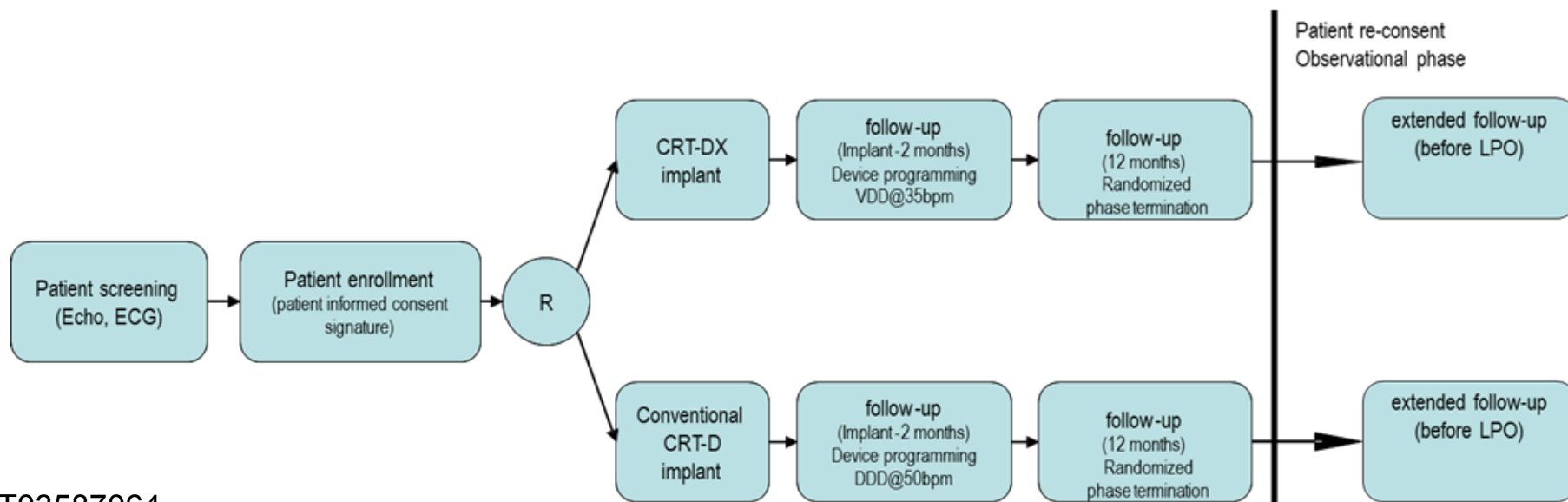
Background

- Cardiac resynchronization therapy defibrillators (CRT-Ds) are typically programmed to DDD mode at a basic rate of 60–70 beats/min.^{1,2} However, several clinical studies have shown that atrial support or rate adaptive pacing in patients with systolic dysfunction does not improve exercise tolerance or clinical outcomes compared with atrial tracking only.³⁻⁵
- Sinus Node Dysfunction is uncommon with optimized therapy, implanting an atrial lead offers no benefit while adding avoidable lead-related risks.
- The CRT-DX system, featuring a floating atrial dipole on the right ventricular lead enables the ideal platform to test whether atrial pacing is truly necessary in the absence of Sinus Node Dysfunction.



Methods

- A prospective, multicenter, randomized, parallel-group **CRT-NEXT trial** was designed to test the non-inferiority of the Atrial Pacing strategy (2-lead CRT-DX) compared with the ATRIAL PACING strategy (3-lead CRT-D system). NO
- **Primary endpoint: 12-month composite endpoint of**
 - all-cause mortality,
 - cardiovascular hospitalization,
 - lead-related complication resulting in loss of functionality not correctable by device reprogramming.



ClinicalTrials.gov unique identifier: NCT03587064

Methods

Main **inclusion** criteria:

- Accepted indication for CRT-D implantation
- No sinus node dysfunction under optimized medical therapy
- Either a resting sinus rate ≥ 45 beats/min at baseline or a maximum heart rate ≥ 85 beats/min during the 6-minute walk test (6MWT).

Main **exclusion** criteria:

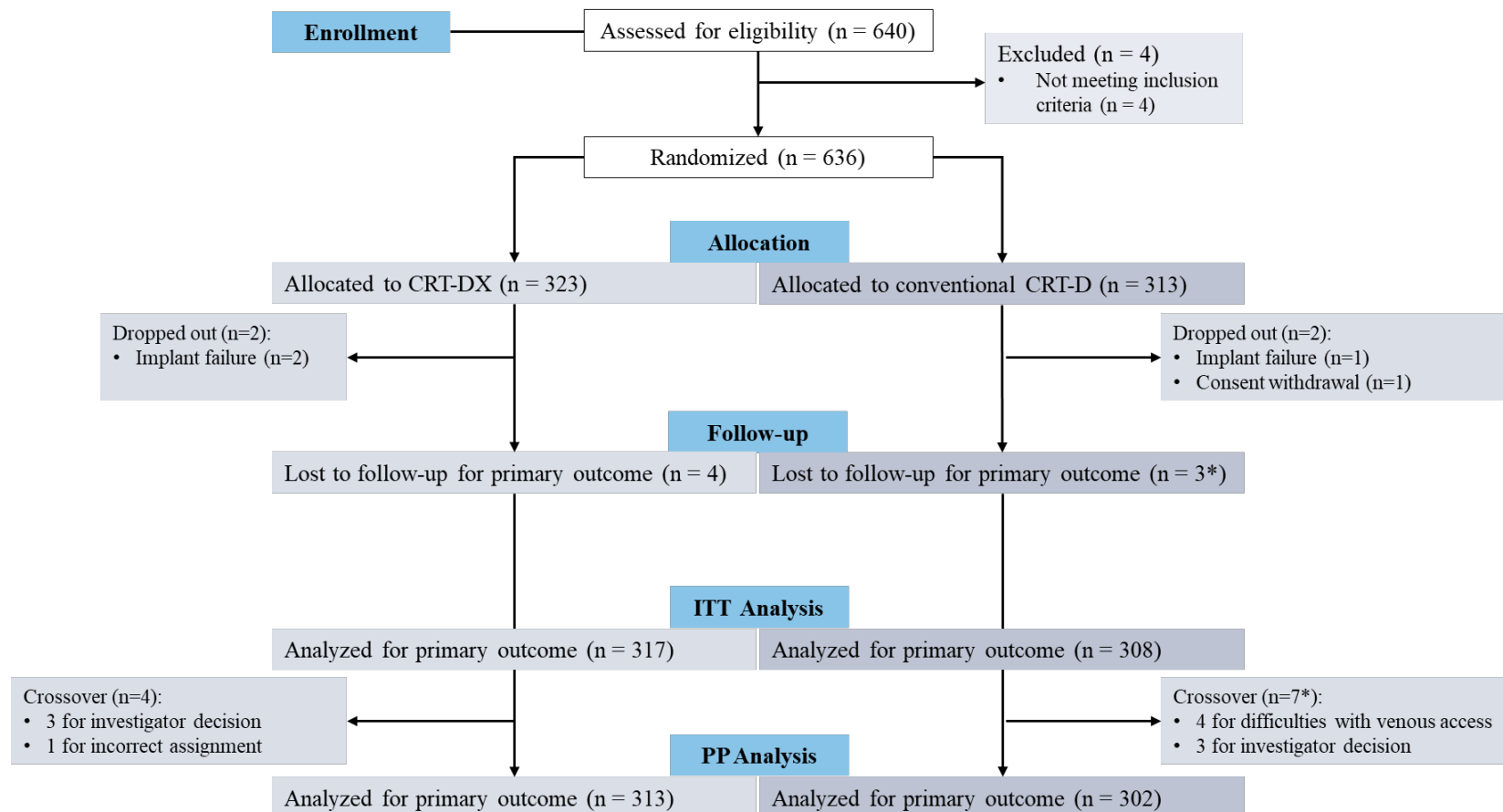
- Indication for atrial pacing;
- NYHA Class IV despite all efforts to recover Class III
- Permanent atrial fibrillation;
- Replacement or upgrade of a previously implanted pacing system.

Sample Size for non-inferiority design:

- Estimated 1-year event rate of 20% in the control CRT-D group and 17% in the CRT-DX group.⁶⁻⁸
- The non-inferiority margin was defined as a relative risk of 1.20 versus the control group, corresponding to 4% absolute difference under study assumptions.
- This margin is consistent with narrowest margins used in previous cardiovascular studies.⁹
- A total sample size of 640 patients provided 80% power to reject the null hypothesis of inferiority with a one-sided (non-inferiority) alpha error of 0.05.

Study realization

- 23 participating centers in Italy
- Enrolment period: Nov 2018 – Mar 2024
- Median follow-up duration: 2.4 years (1.3 – 3.8)
- An independent Data Safety Monitoring Board regularly reviewed all reported adverse events
- Clinical Event Committee adjudicated all potential primary endpoints blinded to treatment assignment
- Randomized patients: 636



* 1 patient who crossed over was lost to follow-up

Population

Characteristic	CRT-DX (N = 323)	CRT-D (N = 313)
Age, years	68 ± 10	68 ± 10
Male sex	237 (73.4)	217 (69.3)
Body mass index, kg/m ²	26.7 ± 4.7	26.6 ± 4.8
NYHA Class I/II/III	19/216/84	22/215/75
LVEF, %	29 ± 6	29 ± 6
LVEDV/BSA, ml/m ²	101 ± 37	95 ± 33
LVESV/BSA, ml/m ²	74 ± 30	68 ± 27
Dilated cardiomyopathy	245 (76.8)	234 (74.8)
QRS duration, ms	157 ± 22	155 ± 19
Left bundle branch block	240 (89.6)	229 (89.1)
Paroxysmal AF	61 (19.1)	48 (15.3)
Persistent AF	8 (2.5)	10 (3.2)
Coronary artery disease	149 (46.7)	133 (42.5)
Previous myocardial infarction	92 (28.8)	92 (29.4)
Previous stroke or transient ischemic attack	33 (10.3)	21 (6.7)
Hypertension	205 (64.3)	200 (63.9)
Diabetes	103 (32.3)	102 (32.6)

Characteristic	CRT-DX (N = 323)	CRT-D (N = 313)
Heart failure–specific pharmacotherapy		
Beta-blocker	277 (87.1)	262 (84.2)
Sotalol	3 (0.9)	2 (0.6)
Ivabradine	19 (6.0)	19 (6.1)
ACE inhibitor or ARB	148 (46.5)	142 (45.5)
Sacubitril-Valsartan	148 (46.5)	140 (44.9)
MRA	146 (46.0)	140 (45.0)
SGLT2 inhibitor	21 (6.5)	29 (9.3)
Amiodarone	42 (13.2)	42 (13.5)
Mexiletine	2 (0.6)	4 (1.3)
Six-minute walk test		
Total walked distance, m	344 ± 120	347 ± 129
Maximum heart rate, beats/min	92 ± 15	94 ± 17

Data are shown as mean ± standard deviation or n (% of non-missing data). Average proportion of missing data across variables: 5.2%.

Procedural Parameters

- Procedures were **significantly shorter** in the CRT-DX group than in the CRT-D group, with a **trend** toward reduced fluoroscopy approaching significance.
- Atrial sensing amplitudes** measured with CRT-DX devices were **larger**, owing to the dedicated input signal amplification of CRT-DX technology.

	CRT-DX	CRT-D	P-Value*
Procedural time, minutes	92 ± 42	107 ± 45	0.028
Fluoroscopy time, minutes	18 ± 14	21 ± 15	0.072
Paced QRS duration, ms	122 ± 24	124 ± 24	0.49
Atrial sensing amplitude			
Pacing system analyzer, mV	2.1 ± 1.4	3.6 ± 1.9	<0.001
Implanted device, mV	6.8 ± 4.7	3.7 ± 2.3	<0.001

Data are shown as mean ± standard deviation. *Pearson's Chi-square test; Wilcoxon rank sum test.

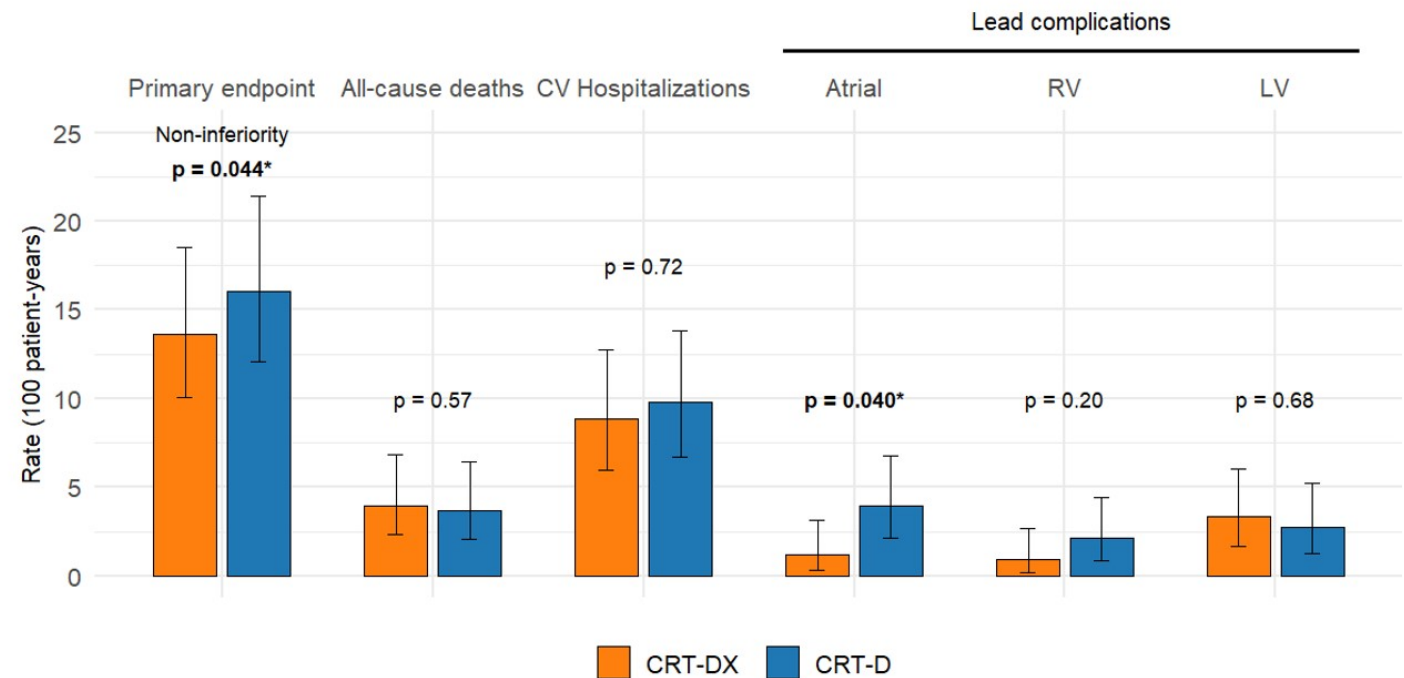
Primary Endpoint

- **Non-inferiority of CRT-DX was confirmed** in both the per-protocol ($p=0.039$) and intention-to-treat ($p=0.044$) analyses.
- In the per-protocol cohort, the primary endpoint occurred in 41 patients in the CRT-DX group (13.1%) and 47 patients in the CRT-D group (15.6%).

	CRT-DX	CRT-D	Hazard Ratio (95% CI)	Non-Inferiority P-value
Per-protocol cohort	N = 313	N = 302		
Primary endpoint	41 (13.1)	47 (15.6)		
Rate per 100 patient-years	13.6 (10.0–18.5)	16.1 (12.1–21.4)	0.82 (0.54–1.25)	0.039
Intention-to-treat cohort	N = 317	N = 308		
Primary endpoint	42 (13.2)	48 (15.6)		
Rate per 100 patient-years	13.8 (10.2–18.7)	16.1 (12.1–21.4)	0.84 (0.55–1.27)	0.044

Primary Endpoint components

- **NO** significant differences in all cause mortality (13 [4.1%] vs. 12 [3.9%]; $p=0.57$) or cardiovascular hospitalizations (29 [9.1%] vs. 32 [10.4%]; $p=0.72$) at 12 months.
- Atrial lead complications were **significantly less frequent in the CRT DX arm** (4 [1.3%] vs. 13 [4.2%]; $p=0.040$): four cases of loss of atrial sensing without evidence of lead dislodgment in the CRT-DX group and 12 atrial lead dislodgements plus one loss of atrial capture in the CRT-D group.
- There were no significant differences in complications related to the RV and LV leads.



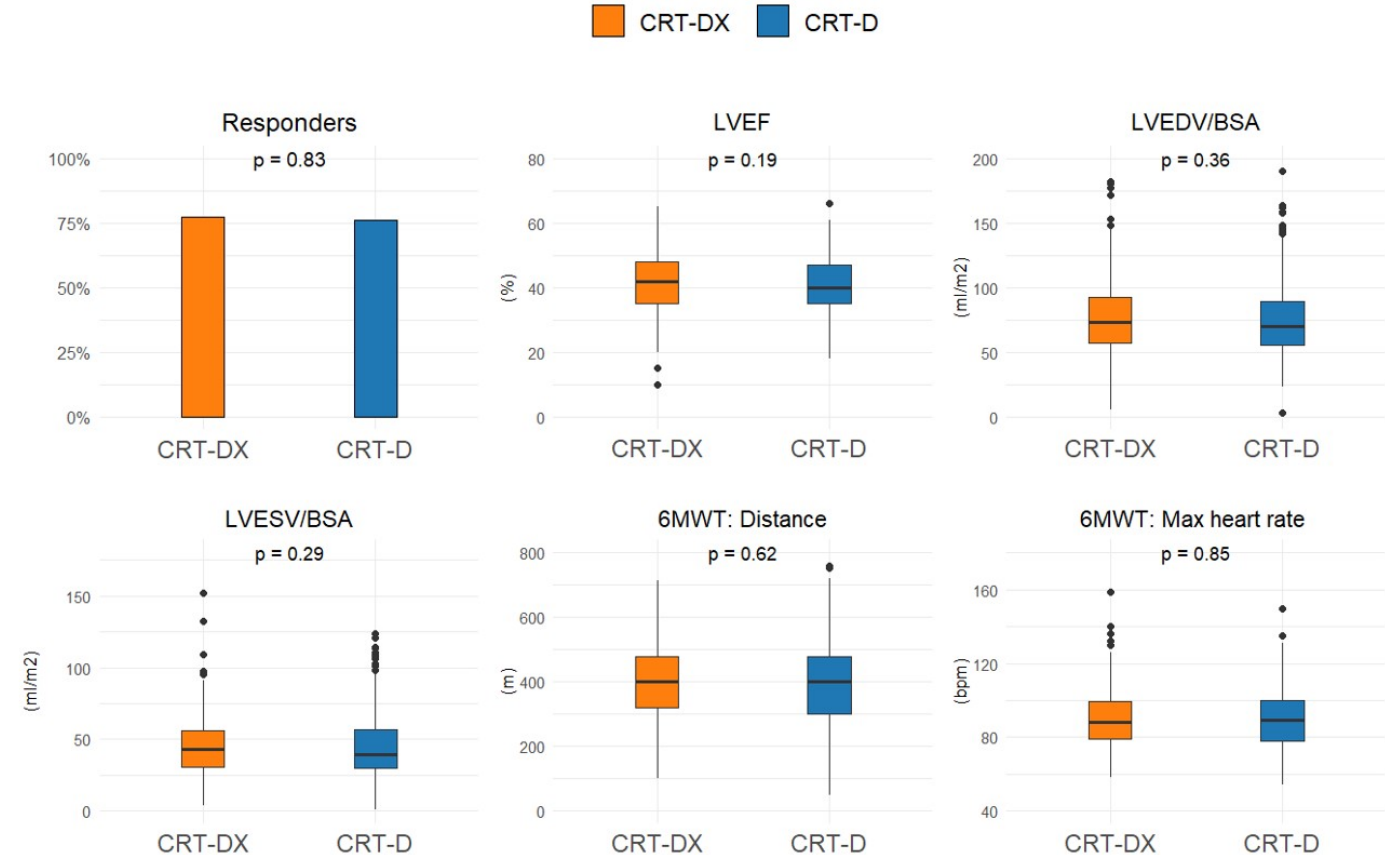
Tachyarrhythmia Detection

	CRT-DX	CRT-D	P-Value
Patients with appropriate ICD therapies	11/317 (3.5)	14/308 (4.5)	0.55
ATP/shock	9/5	12/5	-
Patients with inappropriate ICD therapies	5/317 (1.6)	1/308 (0.3)	0.16
ATP/shock	4/2	2/0	-

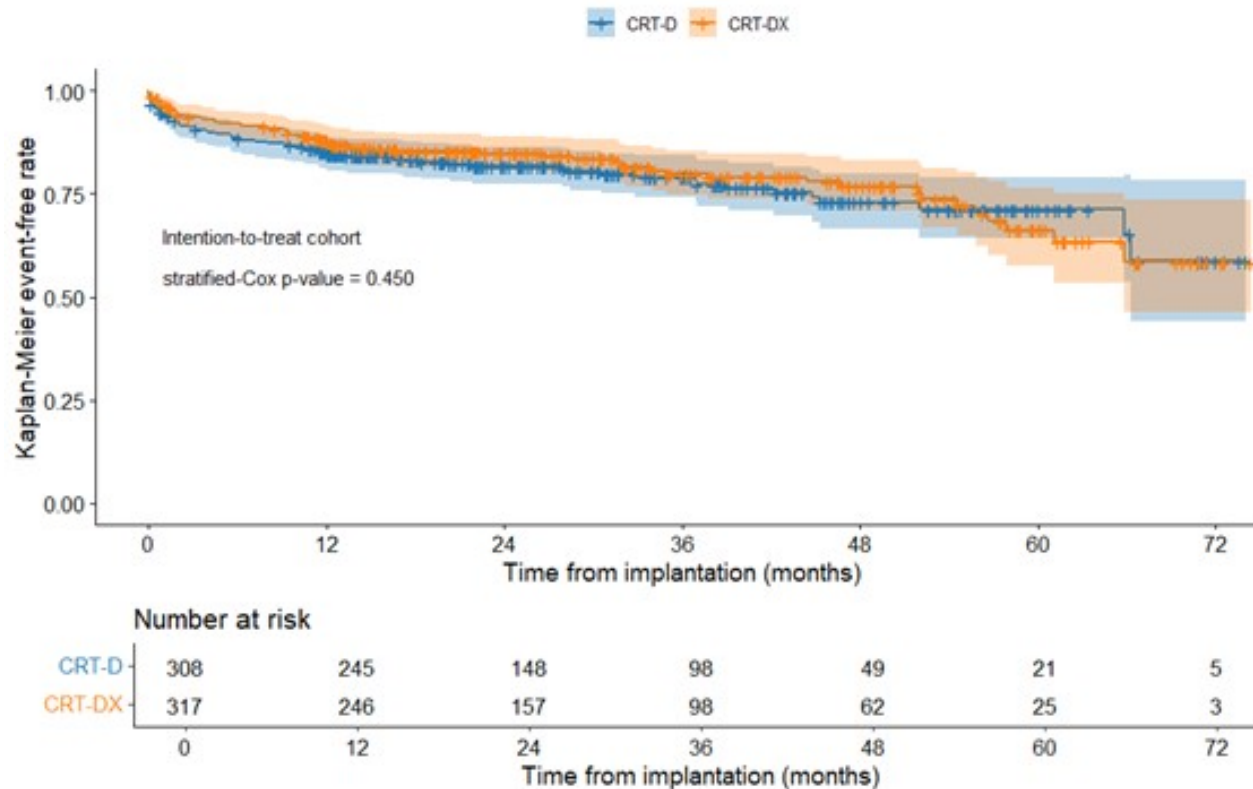
NO VAs occurring during Bradycardia or due to short-long-short sequences

Other 12-Month Results

- Reverse remodeling rates were similar (77% vs. 76%; $p=0.83$), as were LVEF, LVEDV index, and LVESV index.
- The distance covered during the 6MWT was 400 ± 116 m in CRT DX and 398 ± 132 m in CRT D, and maximal heart rate during the test was 90 ± 16 and 90 ± 17 beats/min, respectively, with no between group differences.
- The median atrial pacing percentage in CRT-D patients was relatively low (1%, interquartile range, 0–7) .



Extended Follow-Up



- At a median 2.4 years (interquartile range, 1.3–3.8 years) follow-up, the primary endpoint occurred in 63 patients in the CRT-DX group (19.9%) and 66 patients in the CRT-D group (21.4%), yielding a hazard ratio of 0.87 (95% CI, 0.61–1.24; $p=0.45$).
- Atrial sensing amplitude remained significantly higher in the CRT-DX group compared with the CRT-D group (4.9 ± 3.3 mV vs. 4.1 ± 2.8 mV; $p=0.006$).
- Median CRT delivery was 99% (interquartile range, 96%–100%) in both groups.
- Only one CRT-DX patient (0.3%) required implantation of a standard atrial lead because of newly developed need for atrial pacing after 4.5 years.

Conclusions

- The NO-ATRIAL-Pacing strategy (2-lead CRT-DX) **proved non-inferior** to Atrial Pacing (3-lead CRT-D) for the composite outcome of all-cause mortality, cardiovascular hospitalization, and lead related complications in patients without sinus dysfunction.
- The **CRT-DX** simplified implantation **reduced procedure time and atrial lead–related complications** while preserving immaculate atrial tracking, high rates of echocardiographic reverse remodeling, and functional improvement.
- Reliable atrial sensing is mandatory for CRT recipients without sinus dysfunction, while atrial pacing support is redundant.

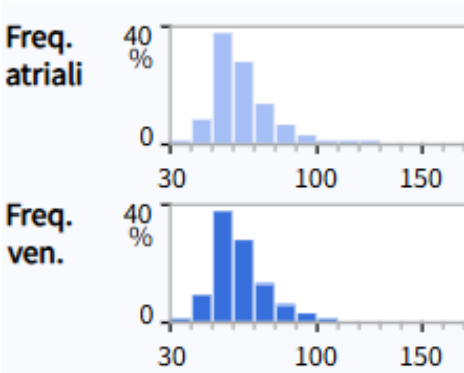
it's time for
CHANGE



Lower Rate	60 bpm
Upper Track	130 bpm
Upper Sensor	130 bpm

82 yrs, responder, carvedilol, active

Impostazioni bradi / CRT / FA	
Modo	VDD / BiV-VS
Freq. base / freq. max. [bpm]	30 / 150
Ritardo AV a 60 bpm / 130 bpm	130 / 100 ms
Cambio modo	200 bpm / VDI
Frequenza TA/FA	200 bpm



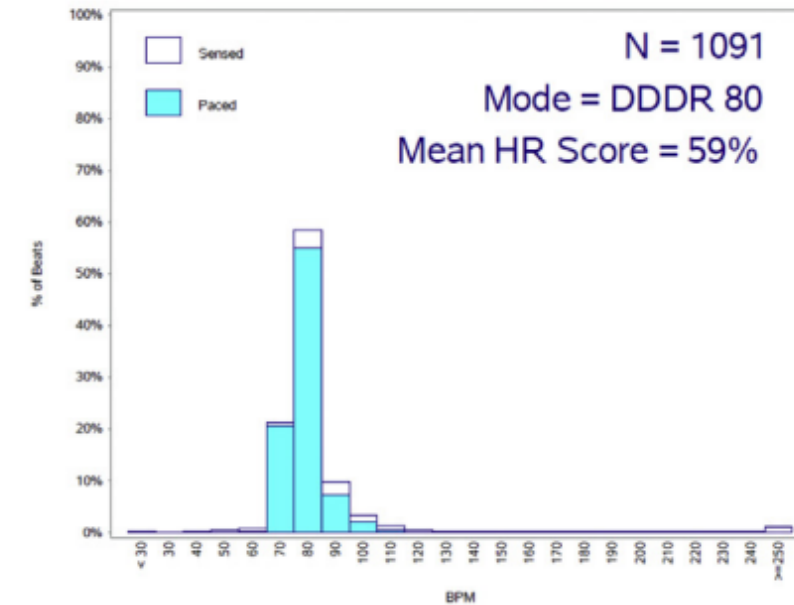
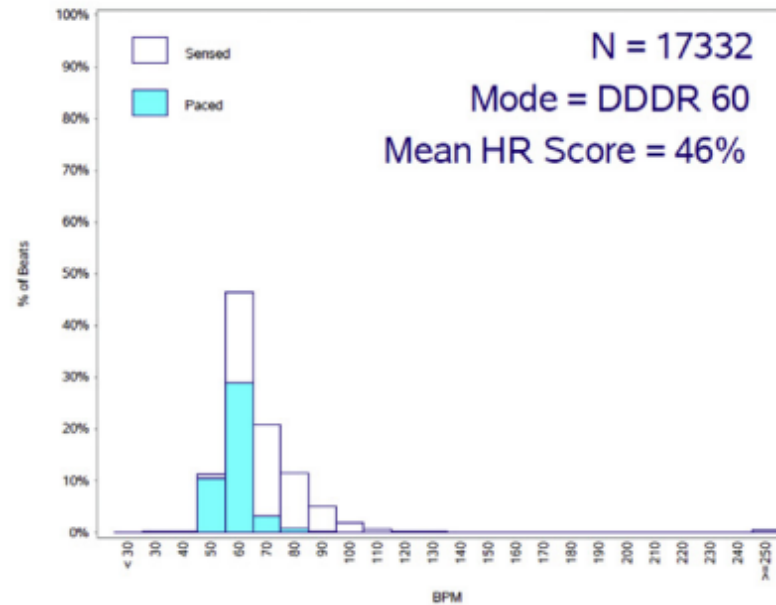
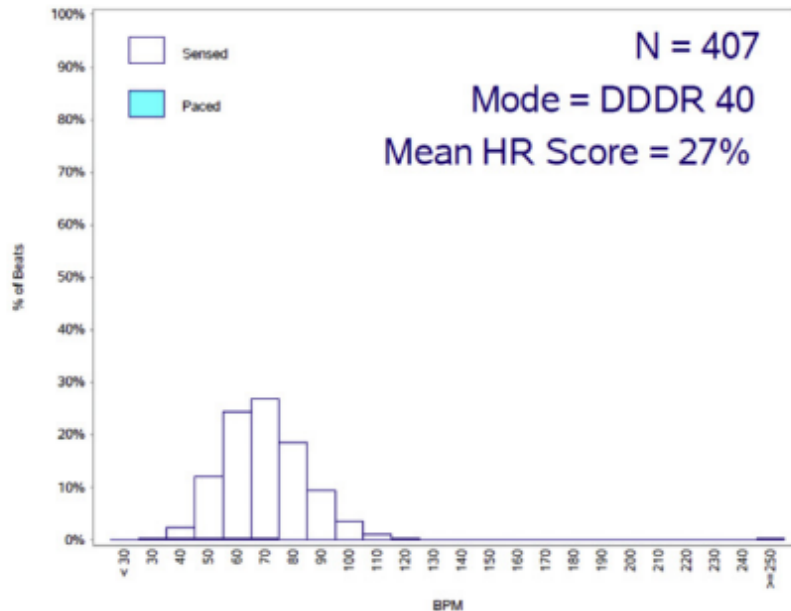
Lower rate limit for pacing by cardiac resynchronization defibrillators: Should lower rate programming be reconsidered?

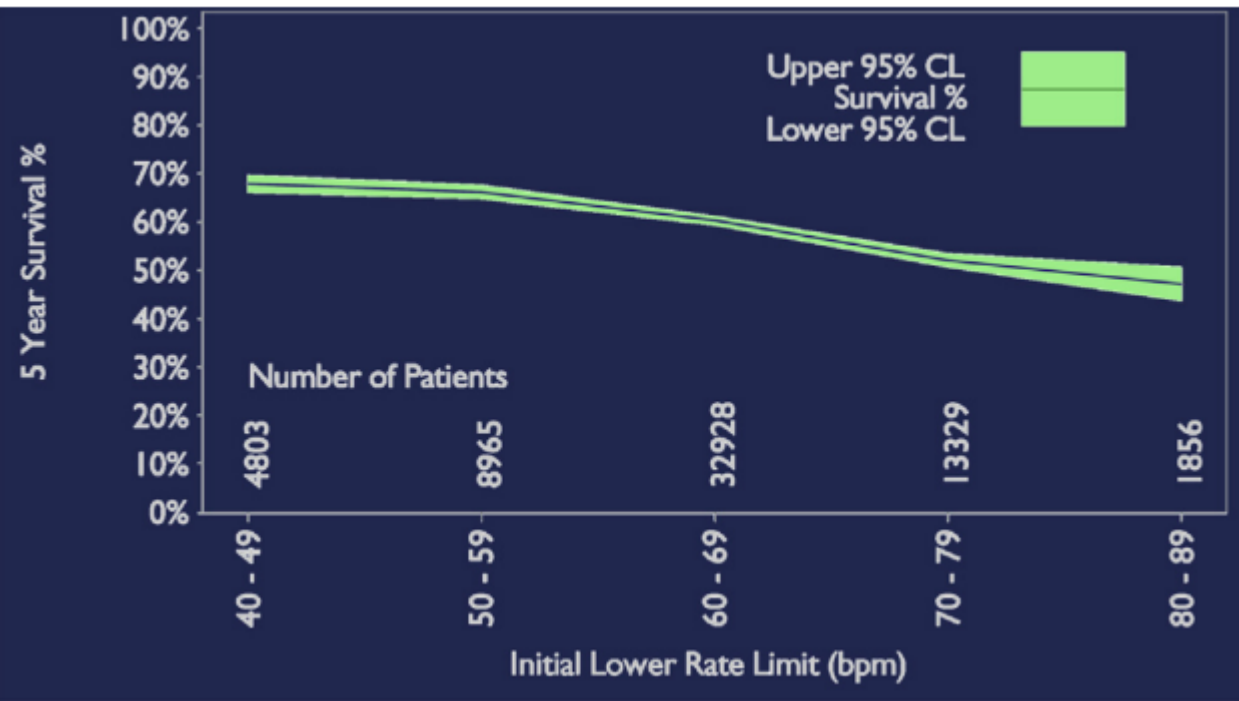
Arjun D. Sharma, MD, FACC,^{*} Bruce L. Wilkoff, MD, FHRS,[†]
Mark Richards, MD, PhD, FHRS,[‡] Nicholas Wold, MS,[§] Paul Jones, MS,[§]
David Perschbacher, BS,[§] Brian Olshansky, MD, FHRS[¶]

From the ^{*}Unafiliated, Reno, Nevada, [†]Cleveland Clinic, Cleveland, Ohio, [‡]Promedica Heart Institute, Toledo, Ohio, [§]Boston Scientific, St. Paul, Minnesota, and [¶]University of Iowa Hospital and Clinics, Iowa City, Iowa.

61881 Patients

Heart Rhythm 2021;18:2087–2093

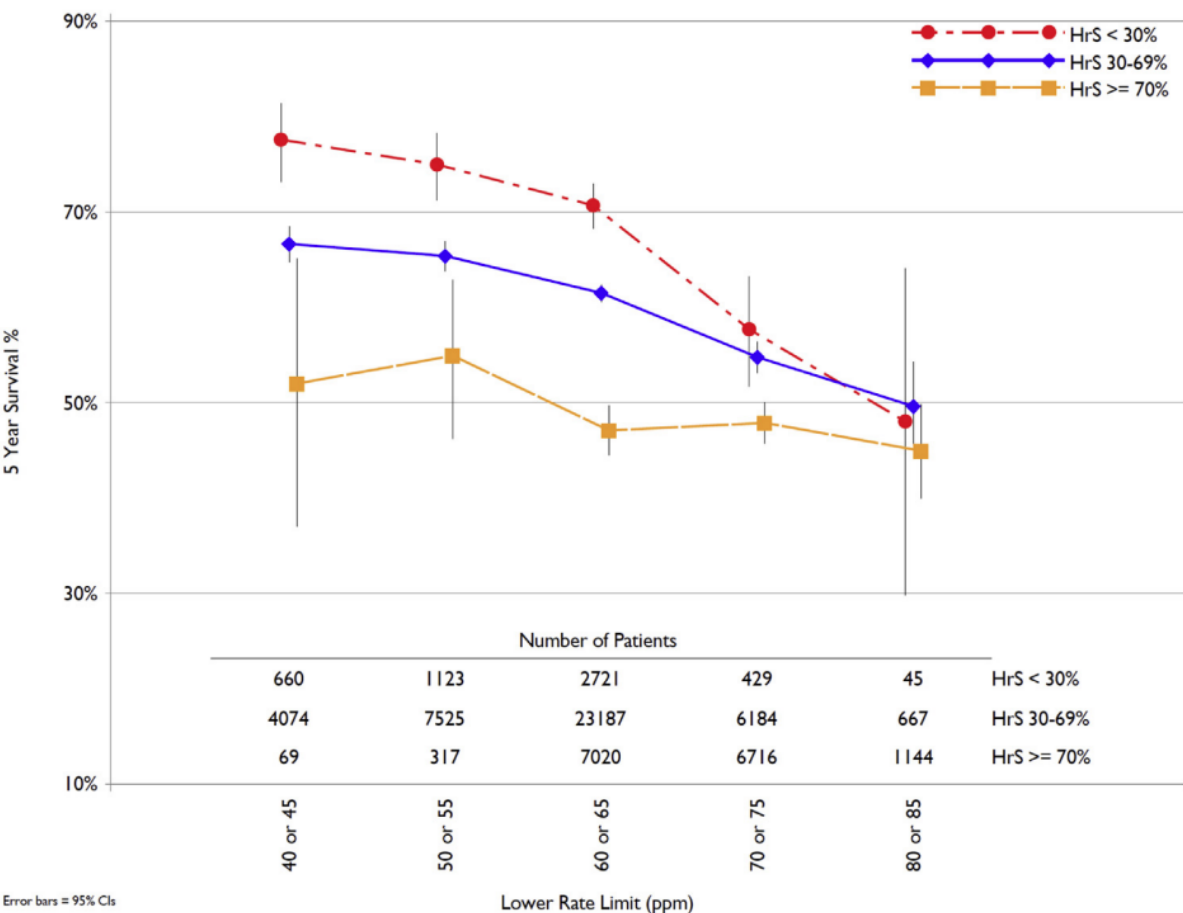




At high LRL, all HrS groups have a low survival and do not differ statistically

RATE LOWERING is the KEY !!!

61881 Patients



Atrial stimulation in CRT without SND

**IS NOT
USELESS**

Is DETRIMENTAL !!

CRT DX : For WHOM?

ALL CRT Candidates who have

**Sinus Rate > 40 bpm at rest or exceed 85
bpm at 6-minute walking test ON DRUGS**

NO Indication to Atrial stimulation

Paroxysmal/Permanent/Persistent AF



Ask Yourself

A hand holding a red marker is shown underlining the text 'Ask Yourself'. The hand is positioned on the right side of the frame, with the thumb and index finger gripping the marker. The marker is a bright red color and has a small, circular eraser at the end. The underline is a thick, solid red line that extends from the left edge of the frame to the right edge, passing directly under the text 'Ask Yourself'.

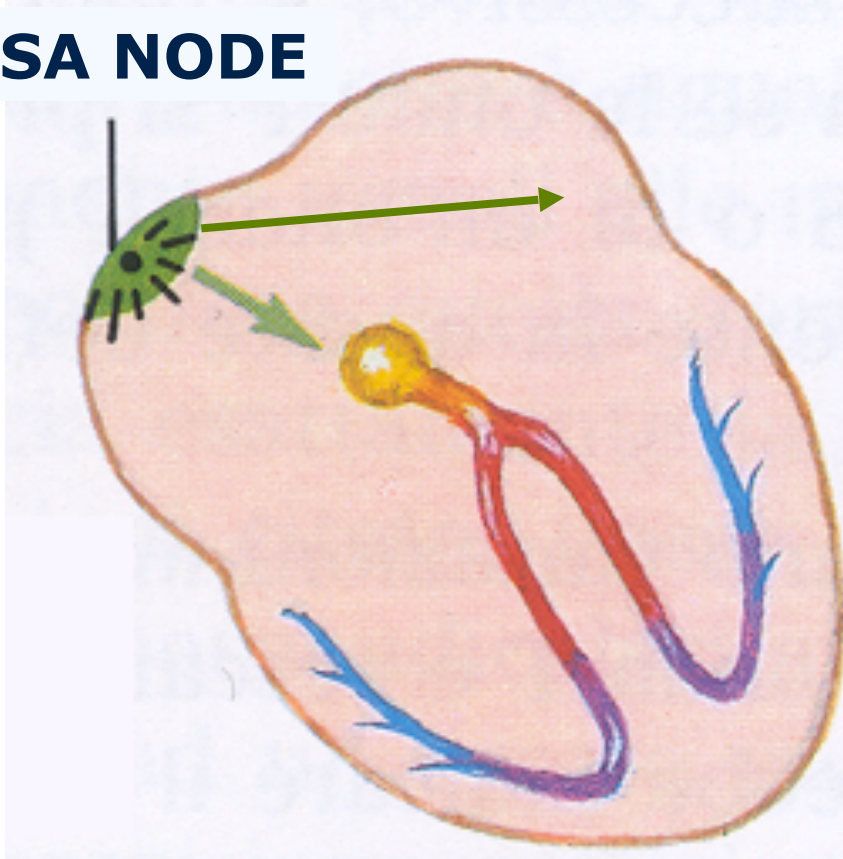
How frequently is Atrial
Stimulation needed in CRT
recipients ?

Sinus Node dysfunction in CRT recipients over a decade (2016-2025)

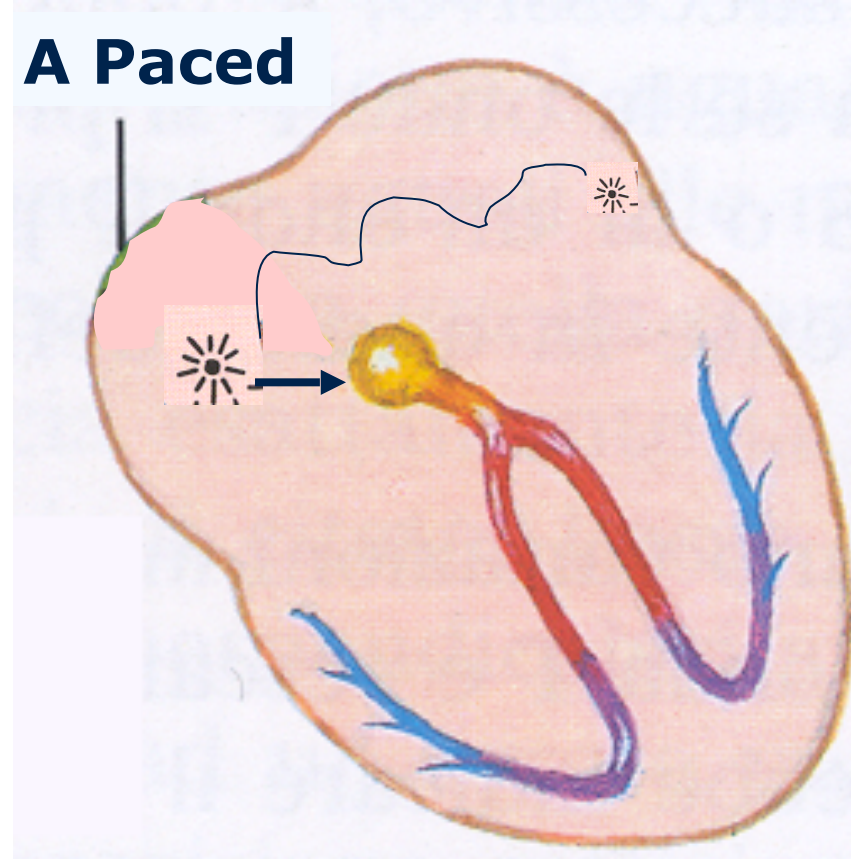
	Mean Age (years)	
✓ First Time CRTD Implant	68±10	1.4%
✓ CRTD Upgrade and replacement	73±13	2%
✓ CRTD Implant/upgrade/ replacement	79±13	3.1%

Atrial Pacing creates IACB in the majority of patients

SA NODE

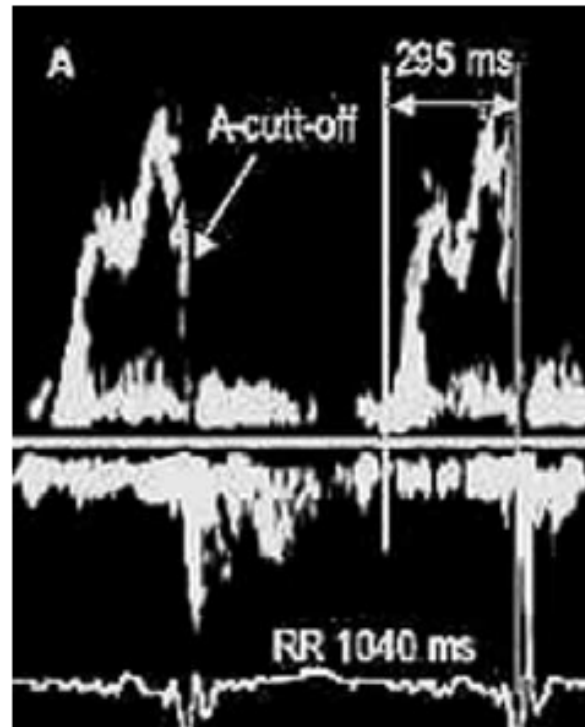


A Paced

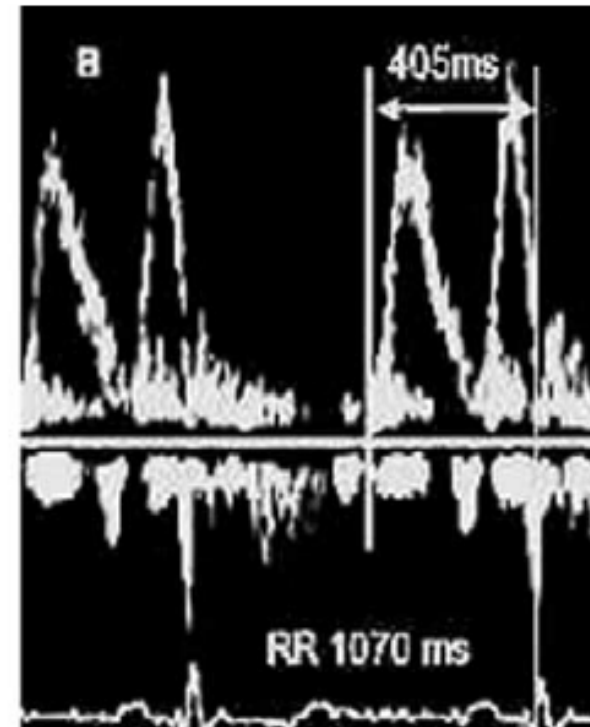


Right Atrial stimulation decreases LV Preload

DDD mode



VDD mode

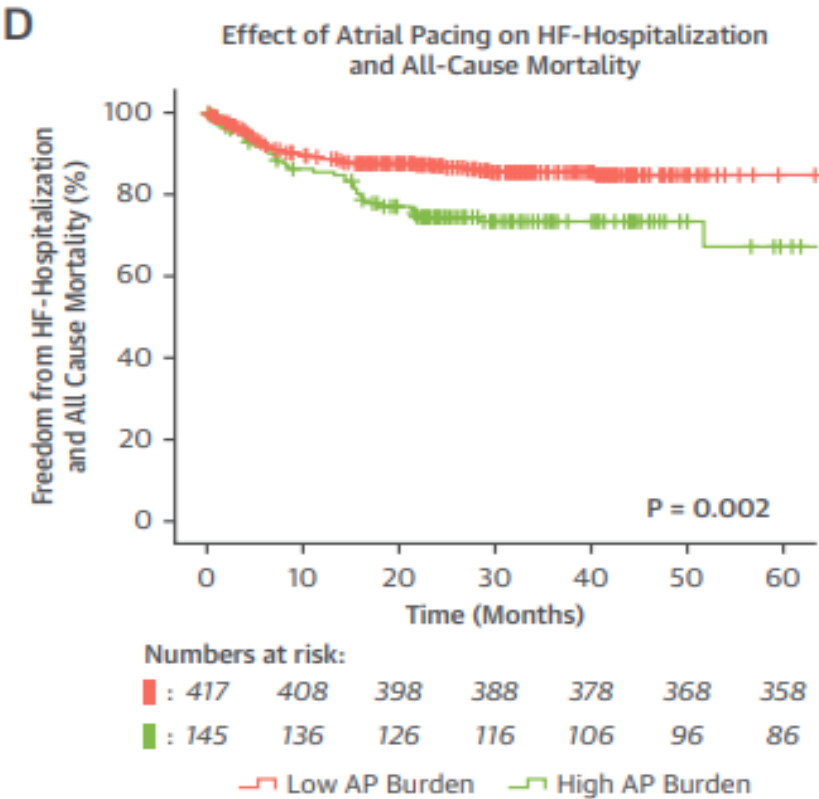
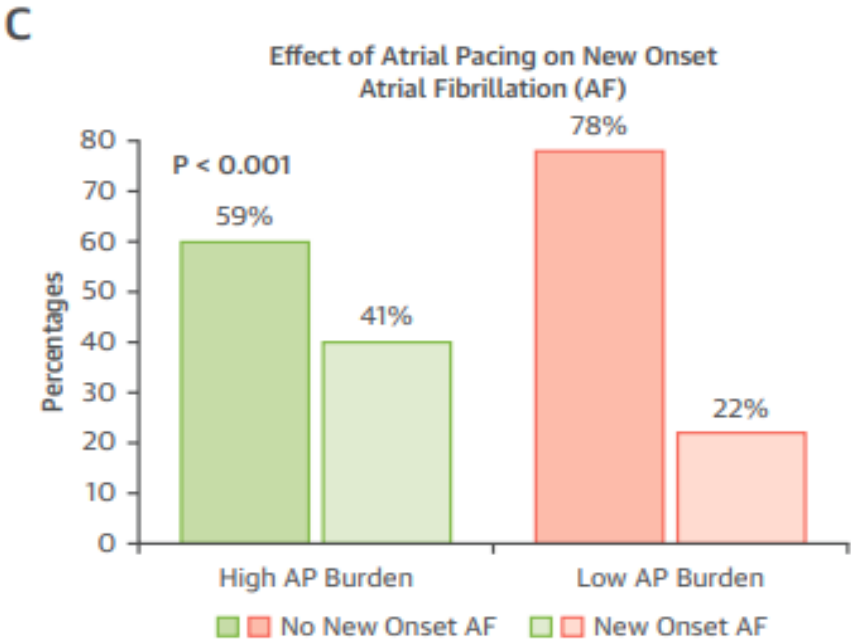
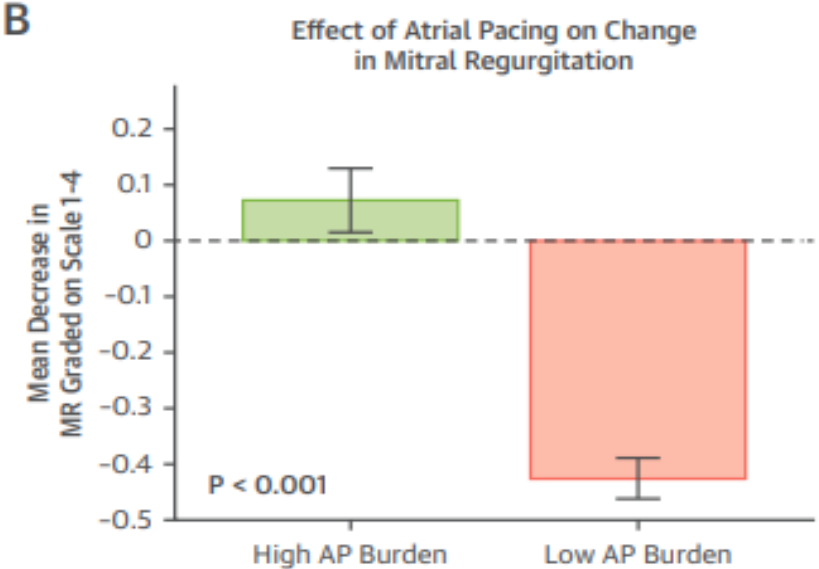
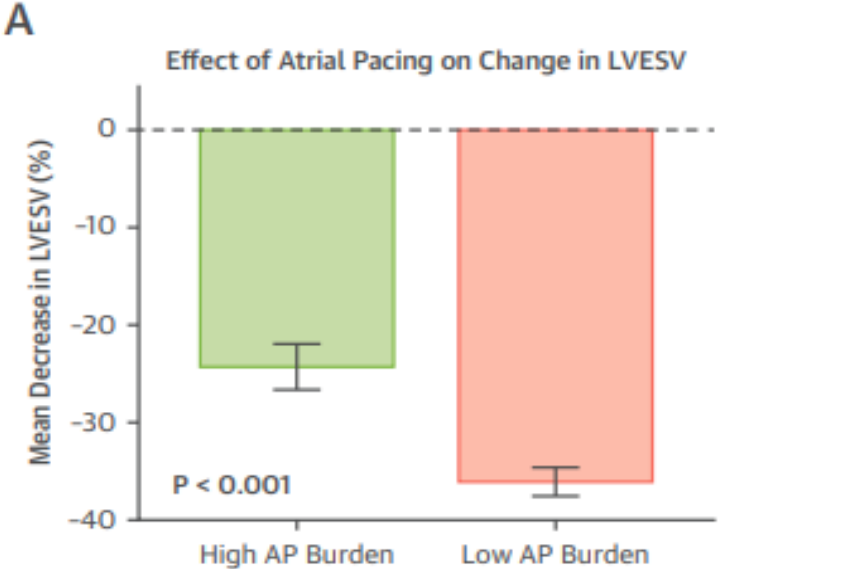


HR ~ 60 bpm

The Detrimental Effect of RA Pacing on LA Function and Clinical Outcome in Cardiac Resynchronization Therapy

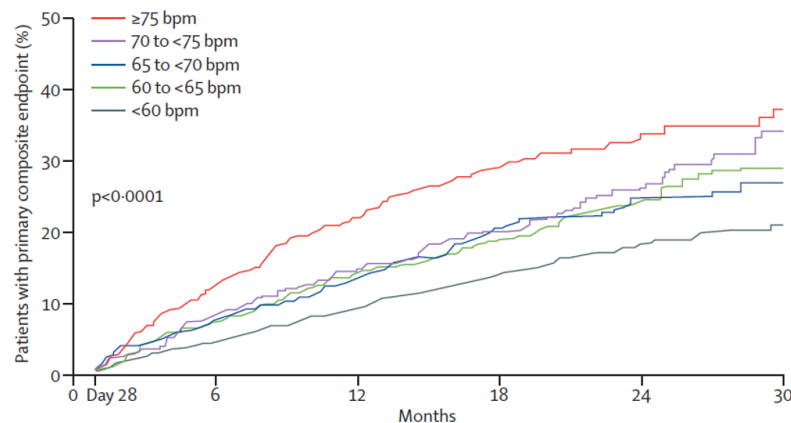
562 Patients

RA pacing > 20% = High Pacing Burden



Atrial stimulation in CRT is redundant.

Might it be dangerous ?



Repeated surgery for Atrial Lead dislodgements or malfunction in 6% of patients !!!!!

Arrhythmia/Electrophysiology

The 1+1 Trial

A Prospective Trial of a Dual- Versus a Single-Chamber Implantable Defibrillator in Patients With Slow Ventricular Tachycardias

Dietmar Bänsch, MD; Frank Steffgen; Gerian Grönefeld, MD; Christian Wolpert, MD; Dirk Böcker, MD; Ralph-Uwe Mletzko, MD; Wolfgang Schöls, MD; Karlheinz Seidl, MD; Michael Piel; Feifan Ouyang, MD; Stefan H. Hohnloser, MD; Karl-Heinz Kuck, MD

Background—The tachycardia detection interval (TDI) in implantable cardioverter/defibrillators (ICDs) is conventionally programmed according to the slowest documented ventricular tachycardia (VT), with a safety margin of 30 to 60 ms. With this margin, VTs above the TDI may occur. However, longer TDIs are associated with an increased risk of inappropriate therapy. We hypothesized that patients with slow VTs (<200 bpm) may benefit from a long TDI and a dual-chamber detection algorithm compared with a conventionally programmed single-chamber ICD.

Methods and Results—Patients with VTs <200 bpm were implanted with a dual-chamber ICD that was randomly programmed to a dual-chamber algorithm and a TDI of ≥ 469 ms or to a single-chamber algorithm with a TDI 30 to 60 ms above the slowest documented VT cycle length and the enhancement criteria of cycle length variation and acceleration. The primary combined end point was the number of all inappropriate therapies, VTs above the TDI, and VTs with significant therapy delay (>2 minutes). After 6 months, a crossover analysis was performed. Total follow-up was 1 year. One hundred two patients were included in the study. The programmed TDI was 500 ± 36 ms during the dual-chamber phase and 424 ± 63 ms during the single-chamber phase. For the primary end point (inappropriate therapies, VTs above the TDI, or VTs with detection delay), a moderate superiority of the dual-chamber mode was found: Mann-Whitney estimator=0.6661; 95% CI, 0.5565 to 0.7758; $P=0.0040$.

Conclusions—Dual-chamber detection with a longer TDI improves VT detection and does not increase the rate of inappropriate therapies despite a considerable increase in tachycardia burden. (*Circulation*. 2004;110:1022-1029.)

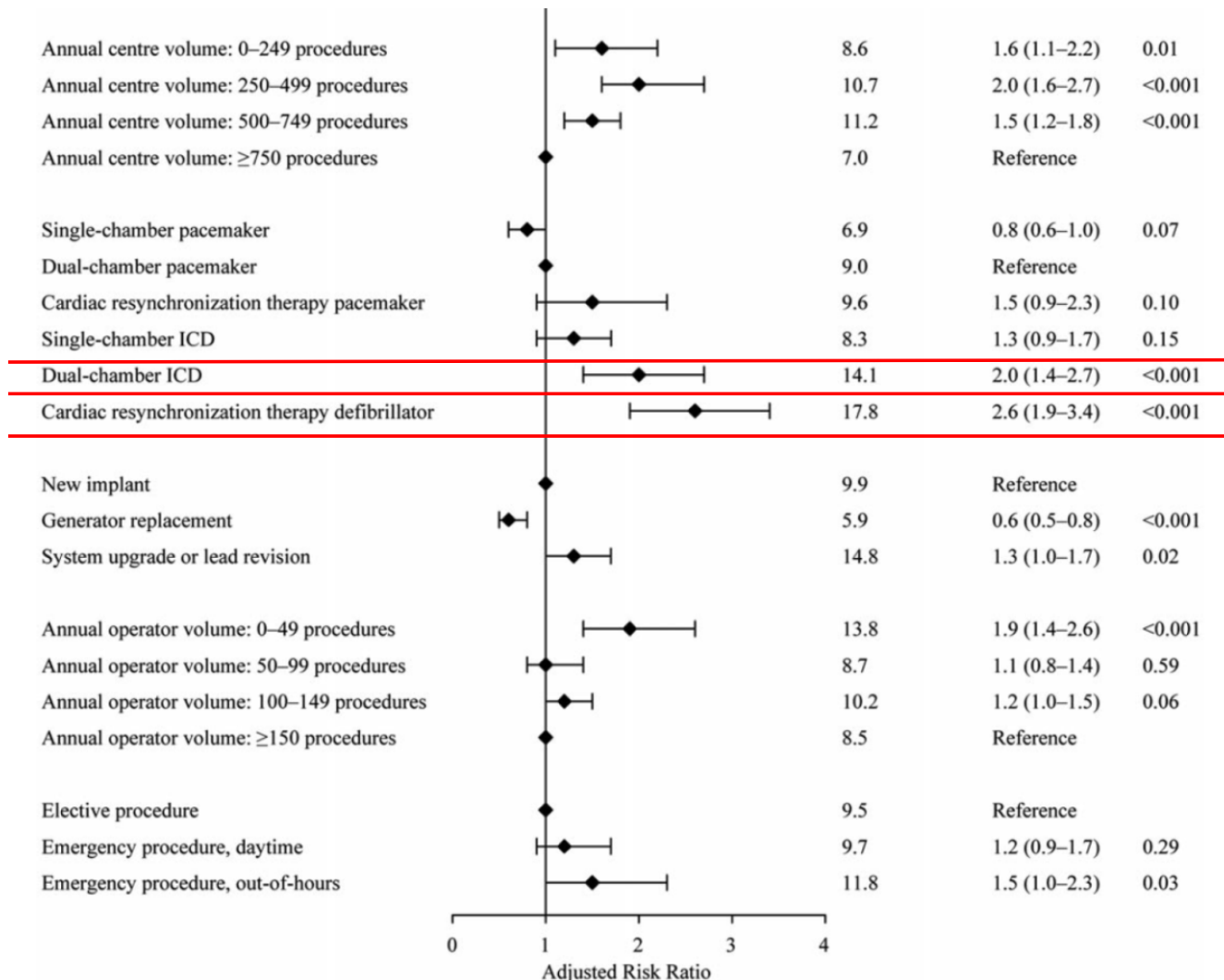
Complications after cardiac implantable electronic device implantations: an analysis of a complete, nationwide cohort in Denmark

Independent AE Predictors

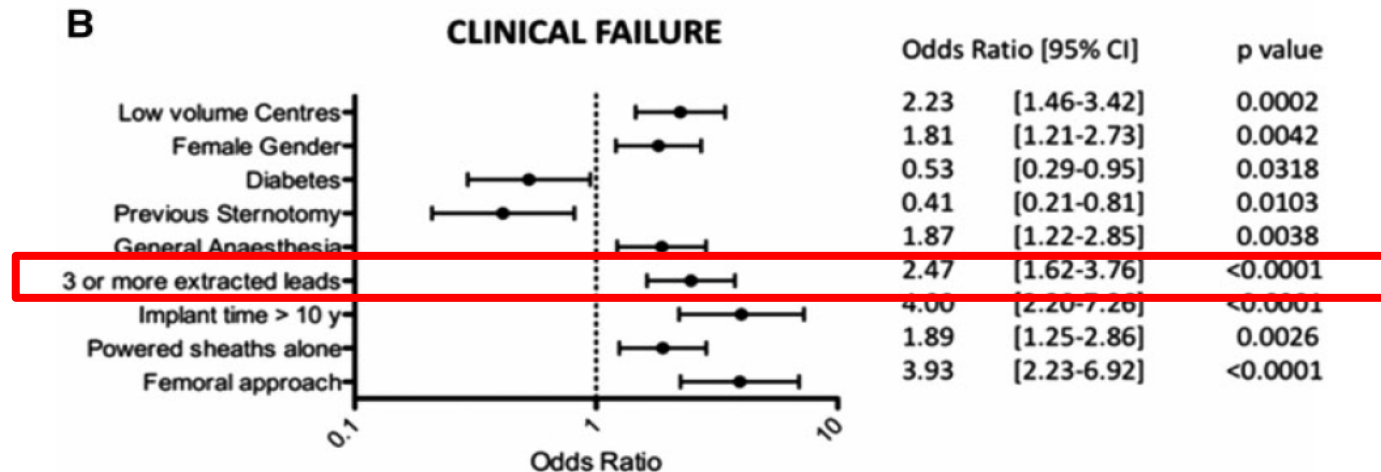
ICD SC	1.3 (0.9–1.7)
ICD DC	2.0 (1.4–2.7)
CRT-D	2.6 (1.9–3.4)

p<0.001

Ever THOUGHT about Lead NUMBER ?????



The European Lead Extraction ConTRolled (ELECTRa) study: a European Heart Rhythm Association (EHRA) Registry of Transvenous Lead Extraction Outcomes

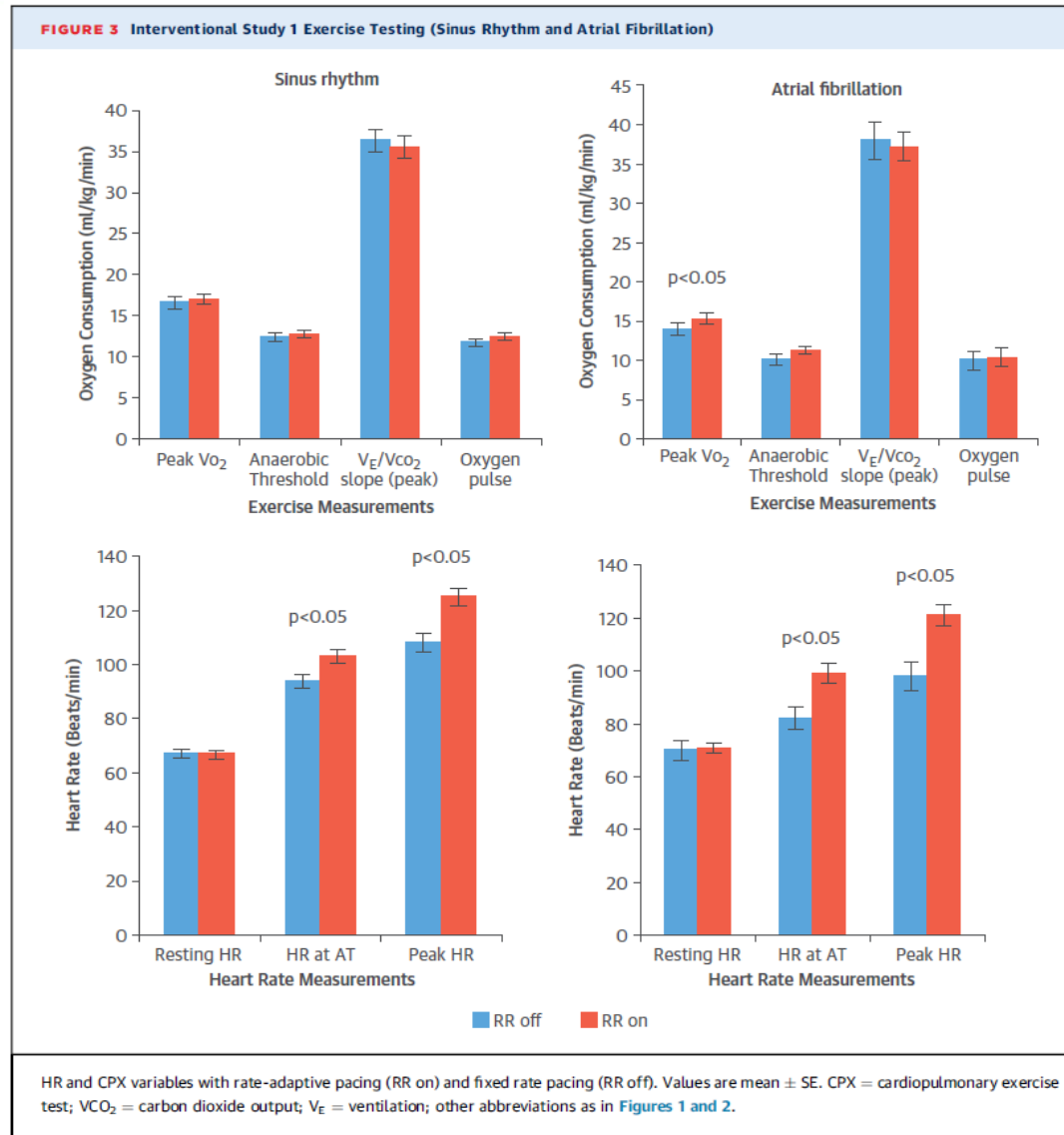


- In the ELECTRA registry 1-year mortality after TLE was 15.5%
- clinical failure was defined as a major complication or failure to achieve the target of TLE
- Clinical Failure doubles when ≥ 3 Leads are to be extracted

An ATRIAL LEAD might KILL YOU !!!

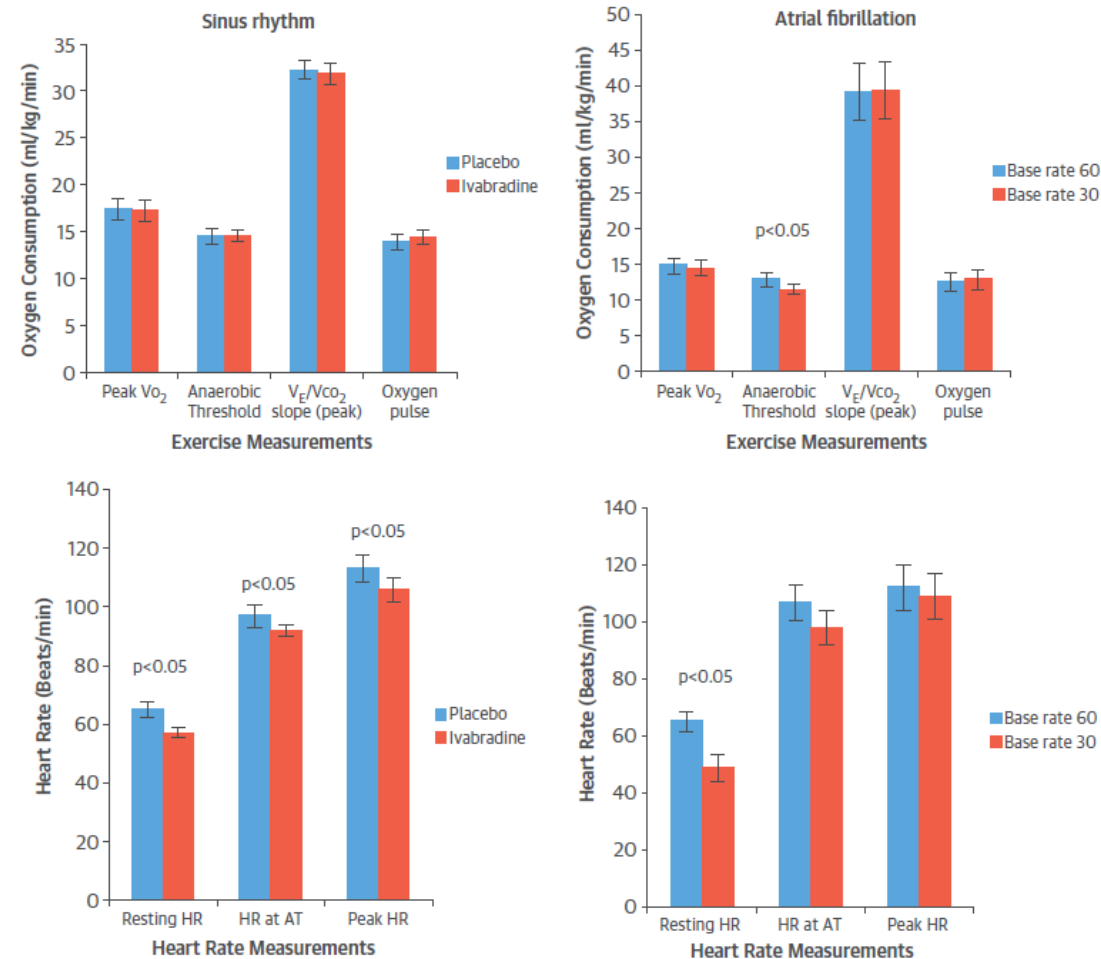


No effect of Rate-Responsive pacing in HF patients



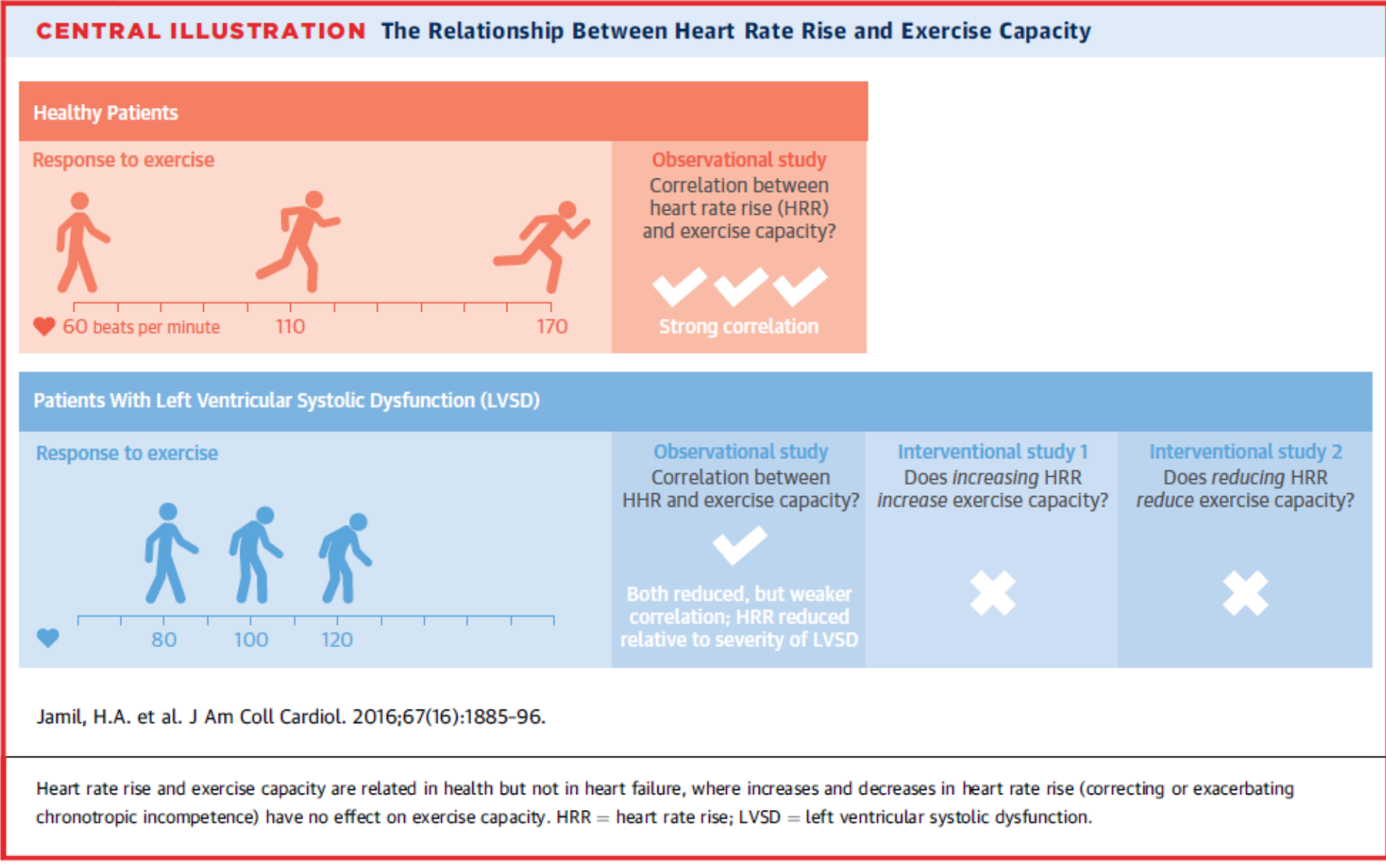
Lowering baseline HR and blunting HR increase in heart failure patients has NO EFFECT

FIGURE 4 Interventional Study 2 Exercise Testing (Sinus Rhythm and Atrial Fibrillation)

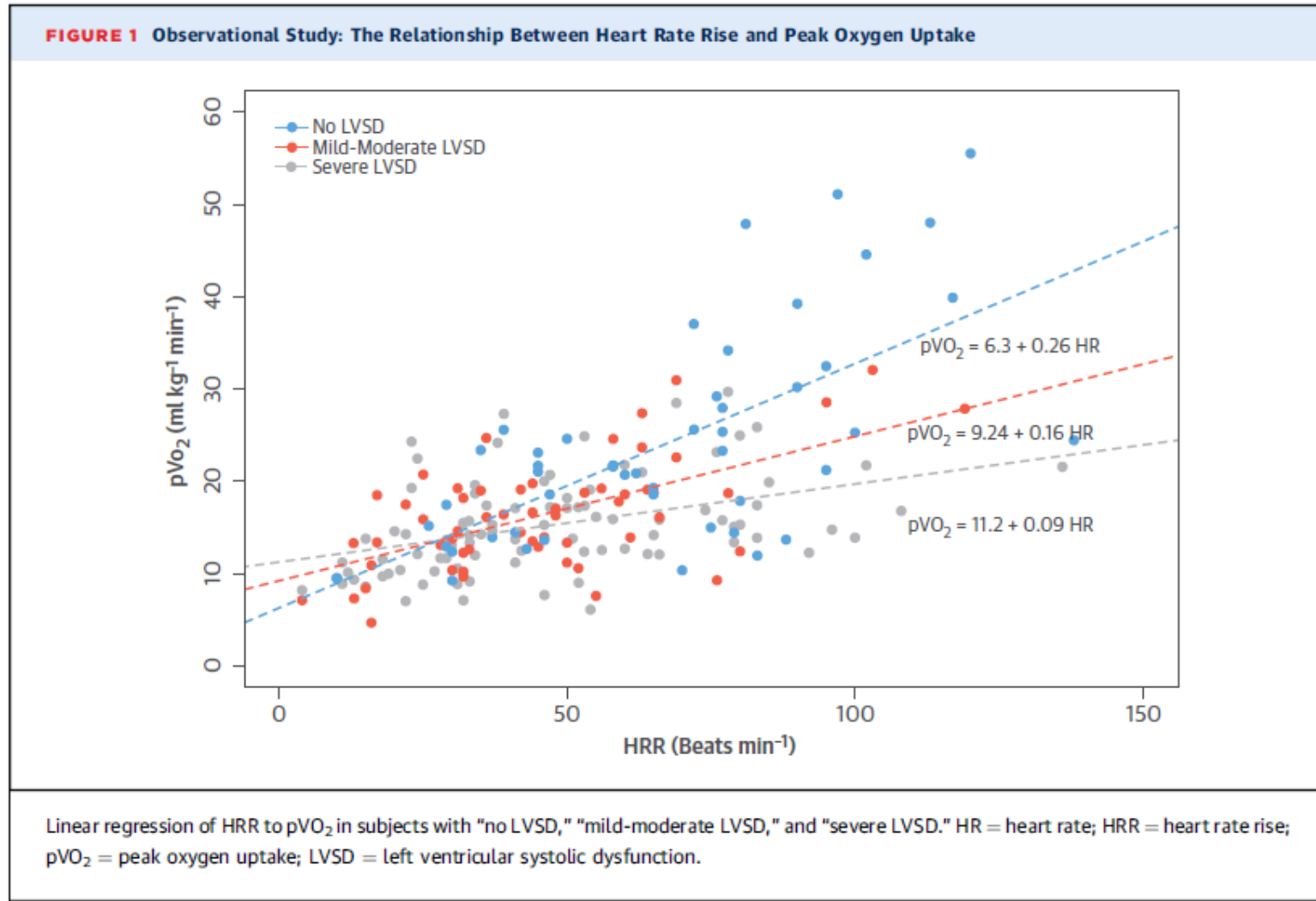


HR and CPX variables following ivabradine or placebo in patients with LVSD and sinus rhythm, and low (30 beats/min) or normal base rate (60 beats/min) programming in patients with LVSD and atrial fibrillation. Values are mean $\pm$ SE. Abbreviations as in Figures 1 to 3.

Clinical meaning of Chronotropic Incompetence: NO functional improvement above 100 bpm



3 STEPS to Prove it: HR/VO₂ relationship in normal vs LV dysfunction subjects



Rate adaptive pacing in people with chronic heart failure increases peak heart rate but not peak exercise capacity: a systematic review

H. I. Clark¹  · M. J. Pearson¹  · N. A. Smart¹ 

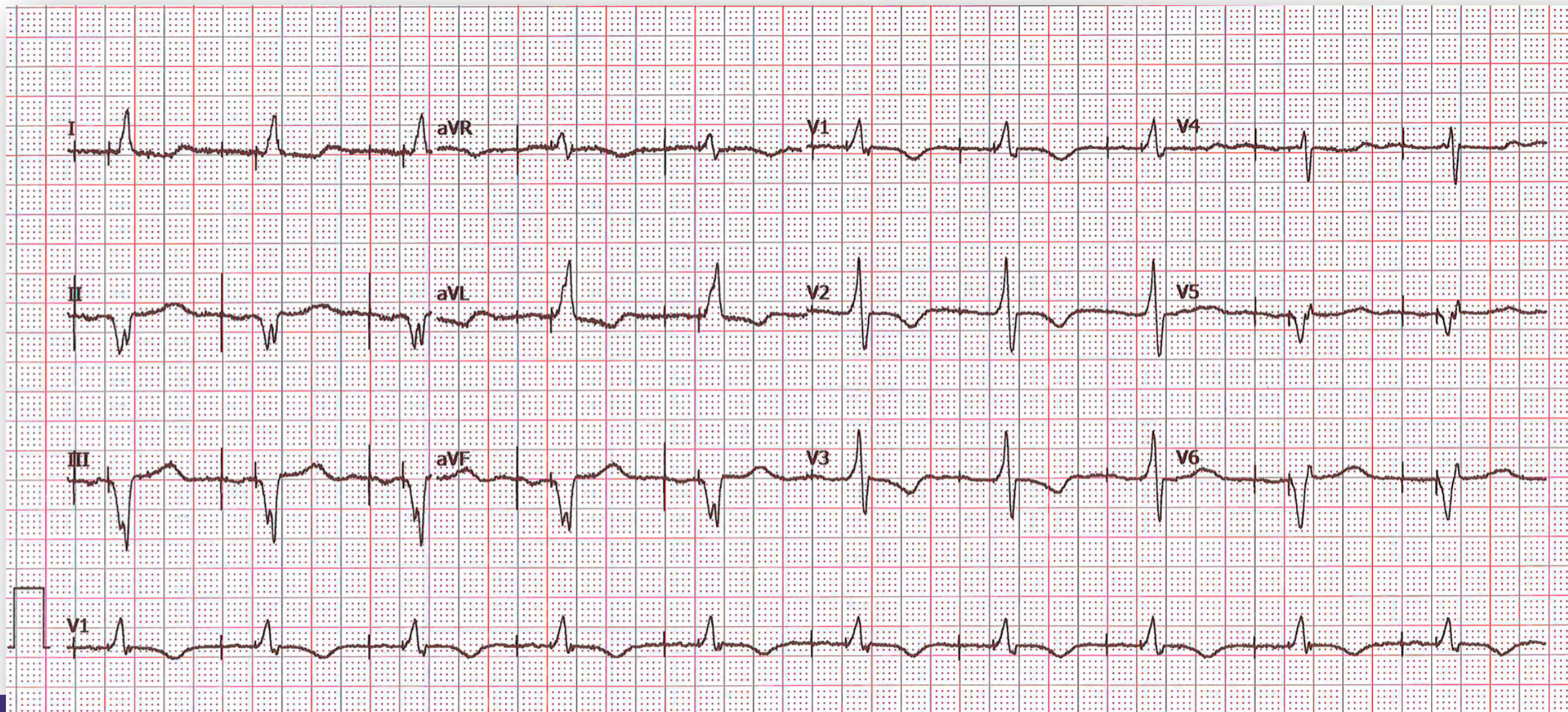
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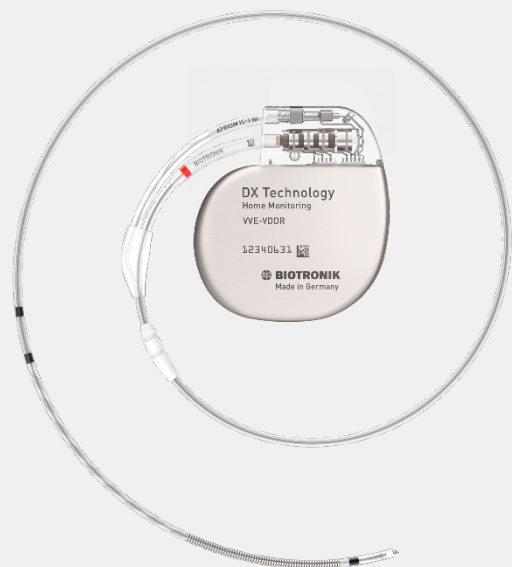
Abstract

Rate adaptive cardiac pacing (RAP) allows increased heart rate (HR) in response to metabolic demand in people with implantable electronic cardiac devices (IECD). The aim of this work was to conduct a systematic review to determine if RAP increases peak exercise capacity (peak VO_2) in line with peak HR in people with chronic heart failure. We conducted a systematic literature search from 1980, when IECD and RAP were first introduced, until 31 July 2021. Databases searched include PubMed, Medline, EMBASE, EBSCO, and the Clinical Trials Register. A comprehensive search of the literature produced a total of 246 possible studies; of these, 14 studies were included. Studies and subsequent analyses were segregated according to comparison, specifically standard RAP (RAPON) vs fixed rate pacing (RAPOFF), and tailored RAP (TLD RAPON) vs standard RAP (RAPON). Pooled analyses were conducted for peak VO_2 and peak HR for RAPON vs RAPOFF. Peak HR significantly increased by 15 bpm with RAPON compared to RAPOFF (95%CI, 7.98–21.97, $P < 0.0001$). There was no significant difference between pacing mode for peak VO_2 $0.45 \text{ ml kg}^{-1} \text{ min}^{-1}$ (95%CI, -0.55 – 1.47 , $P = 0.38$). This systematic review revealed RAP increased peak HR in people with CHF; however, there was no concomitant improvement in peak VO_2 . Rather RAP may provide benefits at submaximal intensities by controlling the rise in HR to optimise cardiac output at lower workloads. HR may be an important outcome of CHF management, reflecting myocardial efficiency.

What if sinus node disease develops years later ??

Atrial Pacing by the floating atrial dipole ..

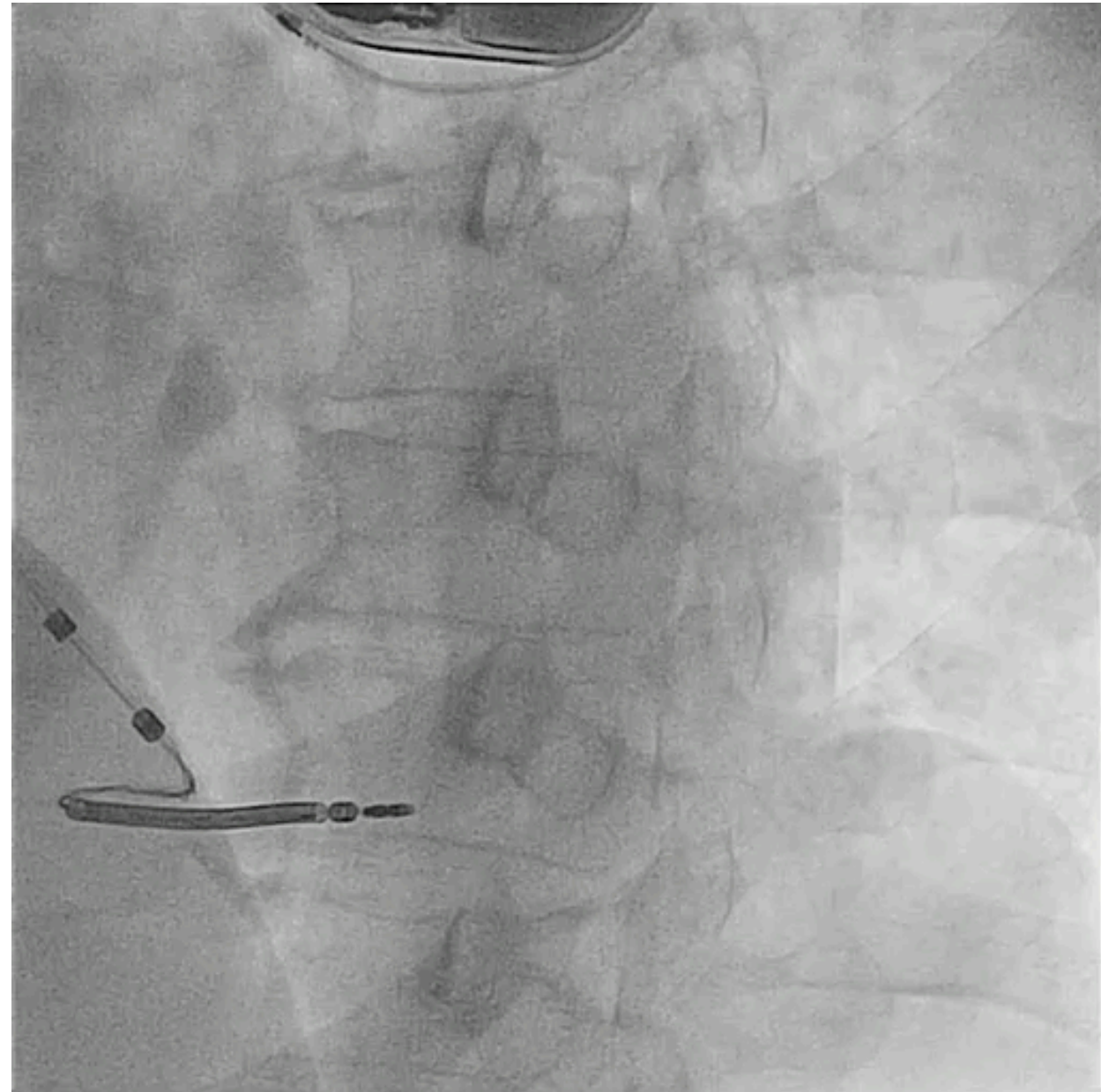
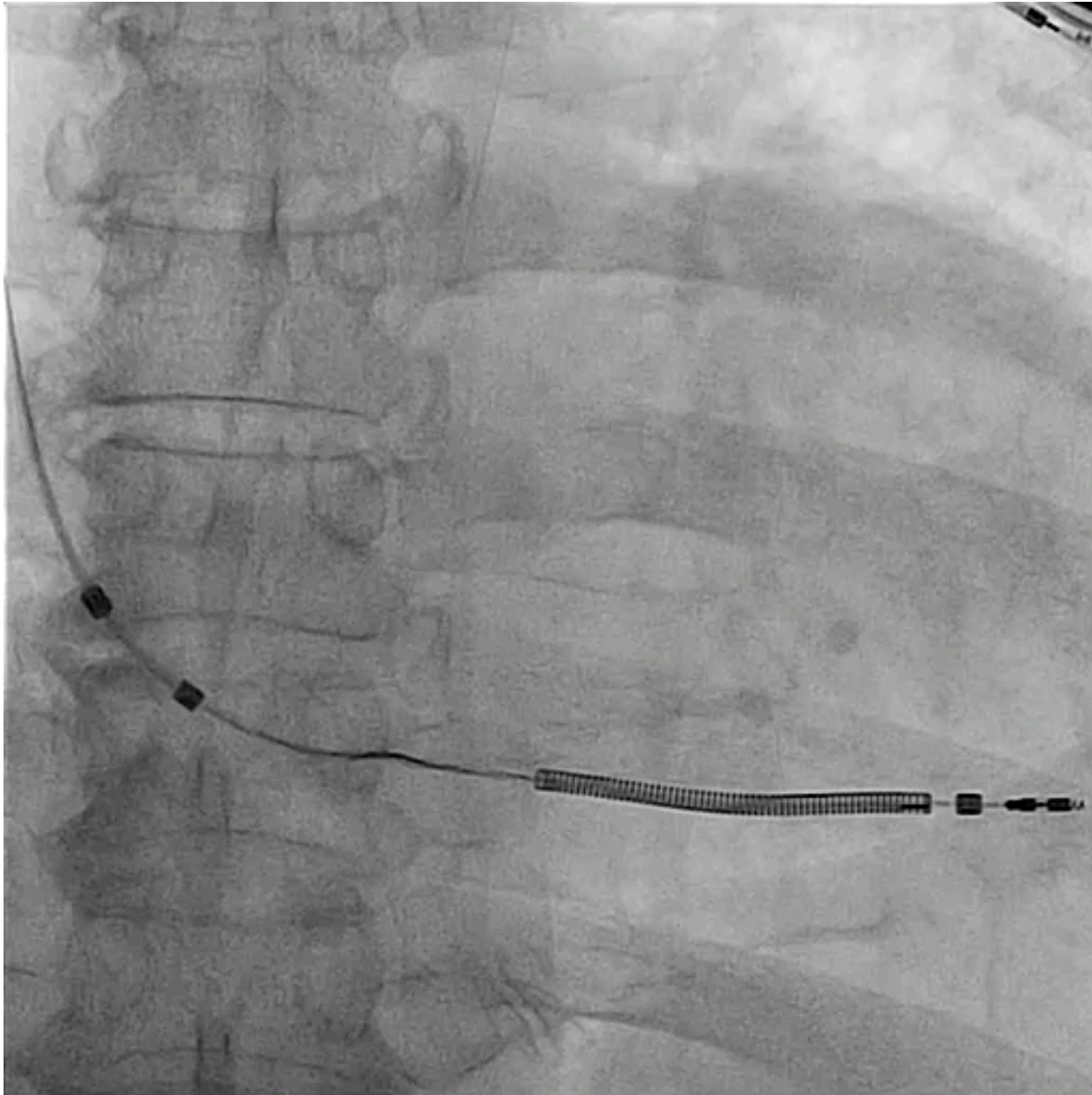




DX implantation for best outcome



BIG ventricles, Large atria, 15 cm dipole distance is OK



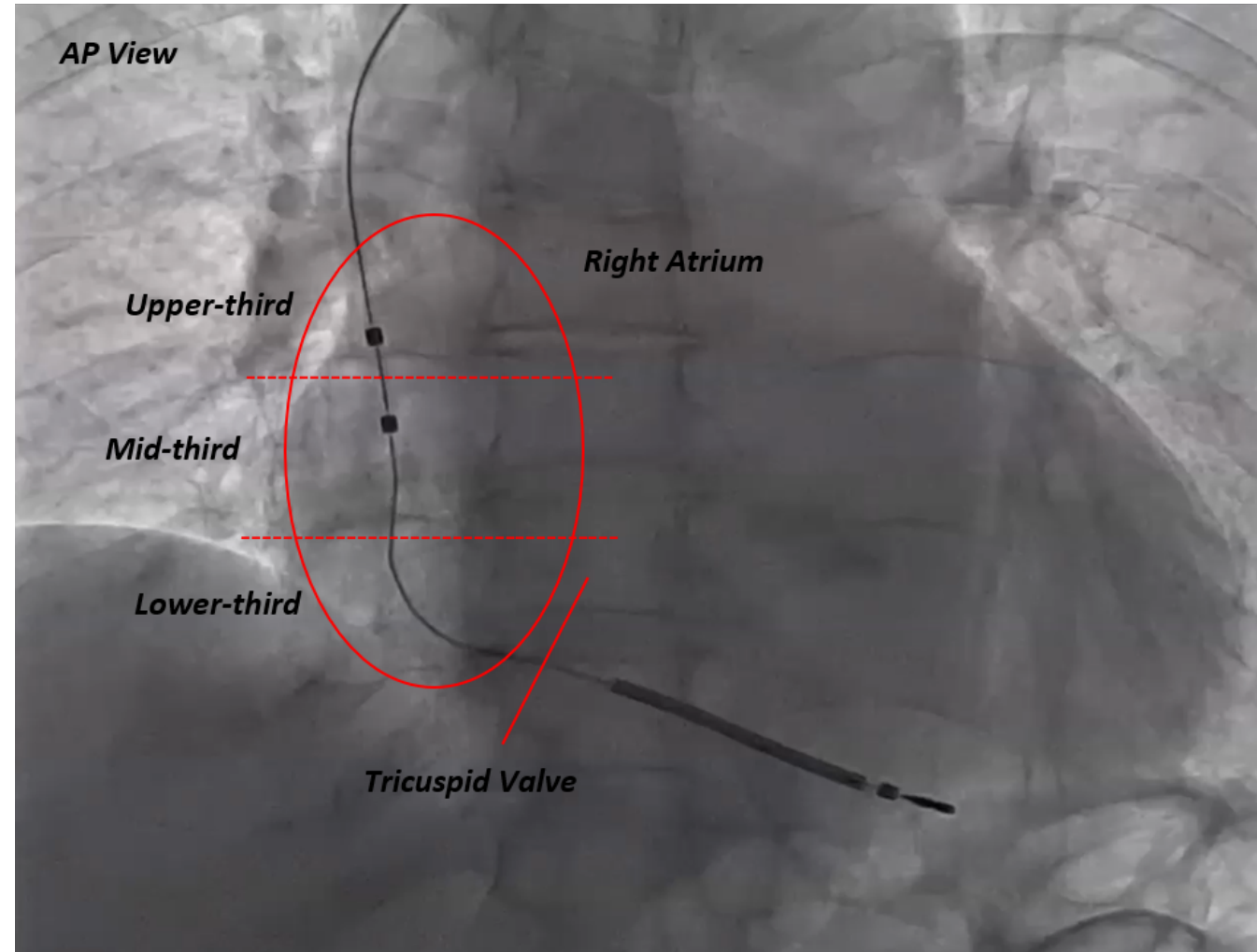
Lead positioning & RX views: discussion

Position of the lead:

- The lead should be **comfortably seated above** the tricuspid valve
- **Gentle** slack
- The floating dipole should be located in the upper-to-mid- third of the RA, though LOW RA is also acceptable
- Use the **AP** and **RAO** views

To avoid:

- Too much pressure on the lead (lead coiling visible)
- Pushing the lead across the TV



Atrial amplitudes and when to screw

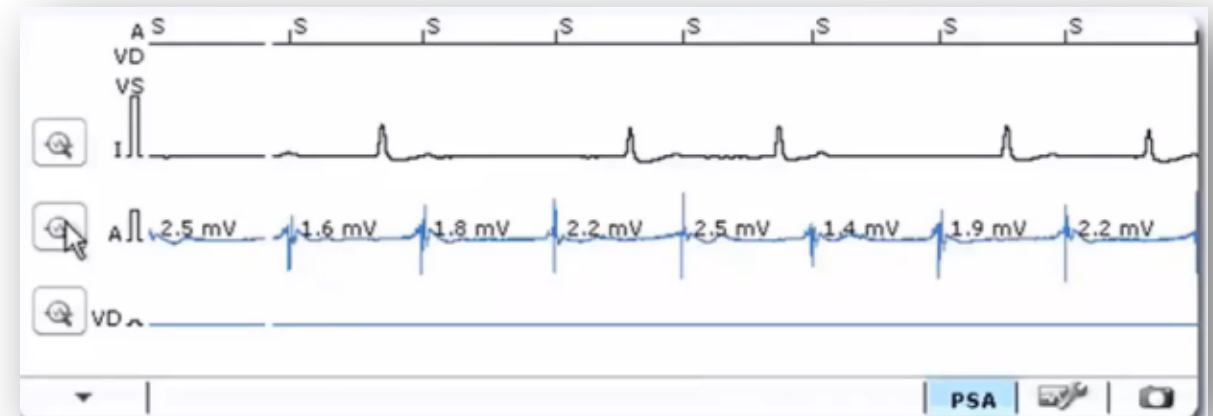
What range of atrial **amplitudes** should we work with? Why?

How to manage the **screwing** of the lead?

Atrial amplitudes and when to screw

Atrial amplitudes:

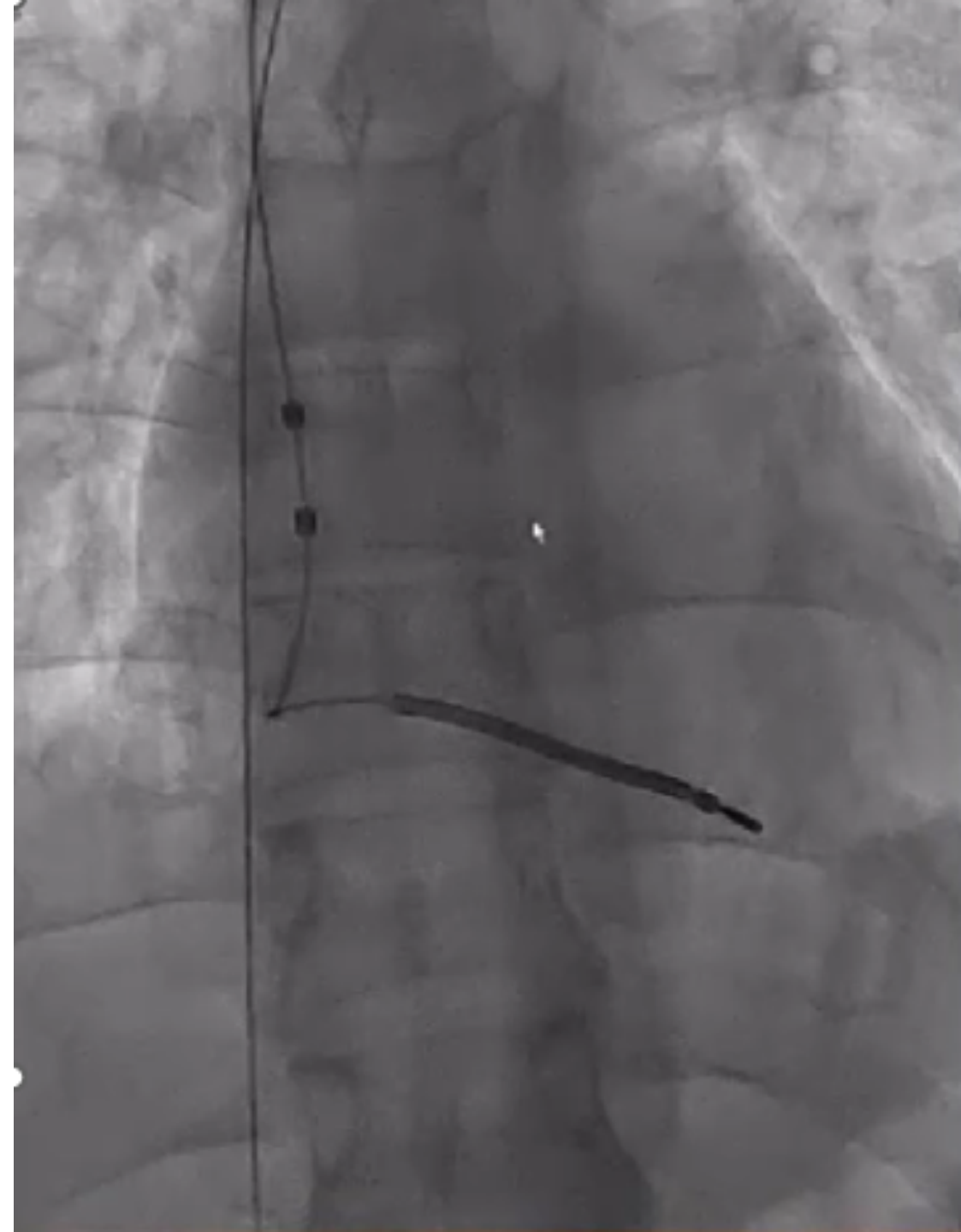
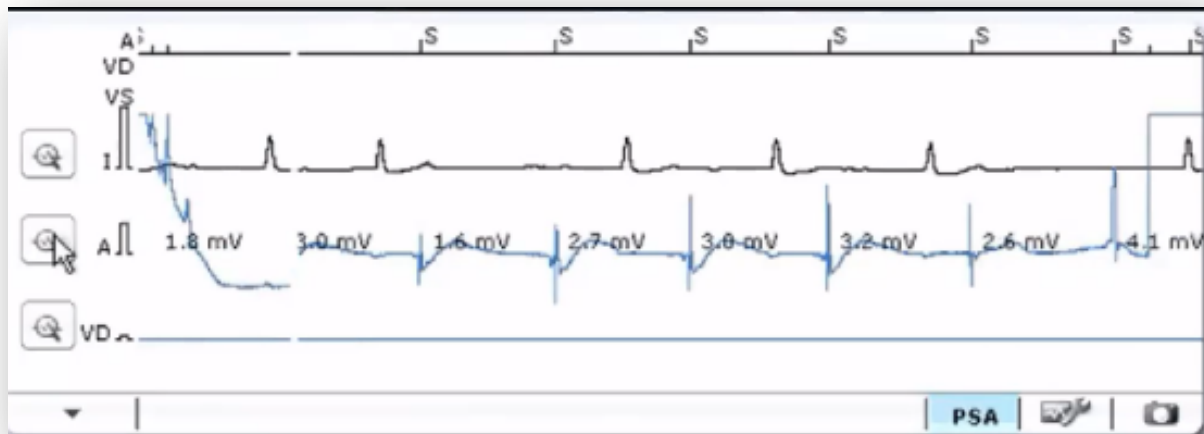
- **Do not** accept less than 0.4 mV
- 0.8/1 mV as the minimum value (without DX) is the average condition
- Test for dipole and signal stability during deep breathing
- Screw the lead only after measuring the atrial amplitudes
- Keep the stylet inserted in the innominate vein while moving the lead to find the best Signal amplitude, as to avoid applying too much pressure and gain backward bouncing afterwards
- Suture the sleeve to lead first , then to the muscle while keeping the Atrial signal monitored



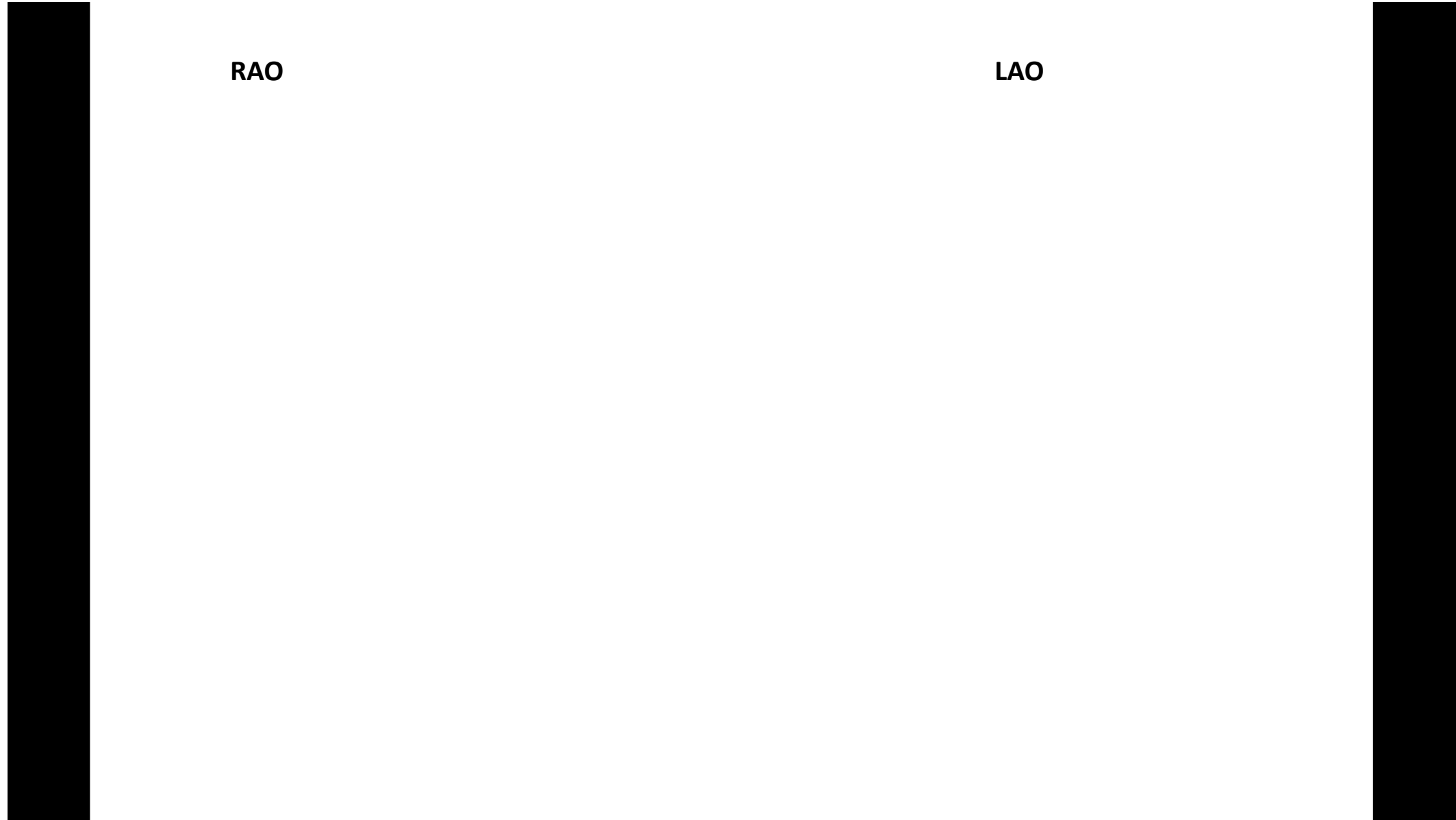
Sampling of the A signal:

Map the atrial signal around the position chosen:

- Move the dipole a bit higher and lower to verify the signal keeps **good values**
- **Check amplitude stability during breathing**
- Keep a close look on the lead **slack** after stylet withdrawal



How and when to use different RX views



RAO

LAO

Noise:

When should we pay attention to noise?

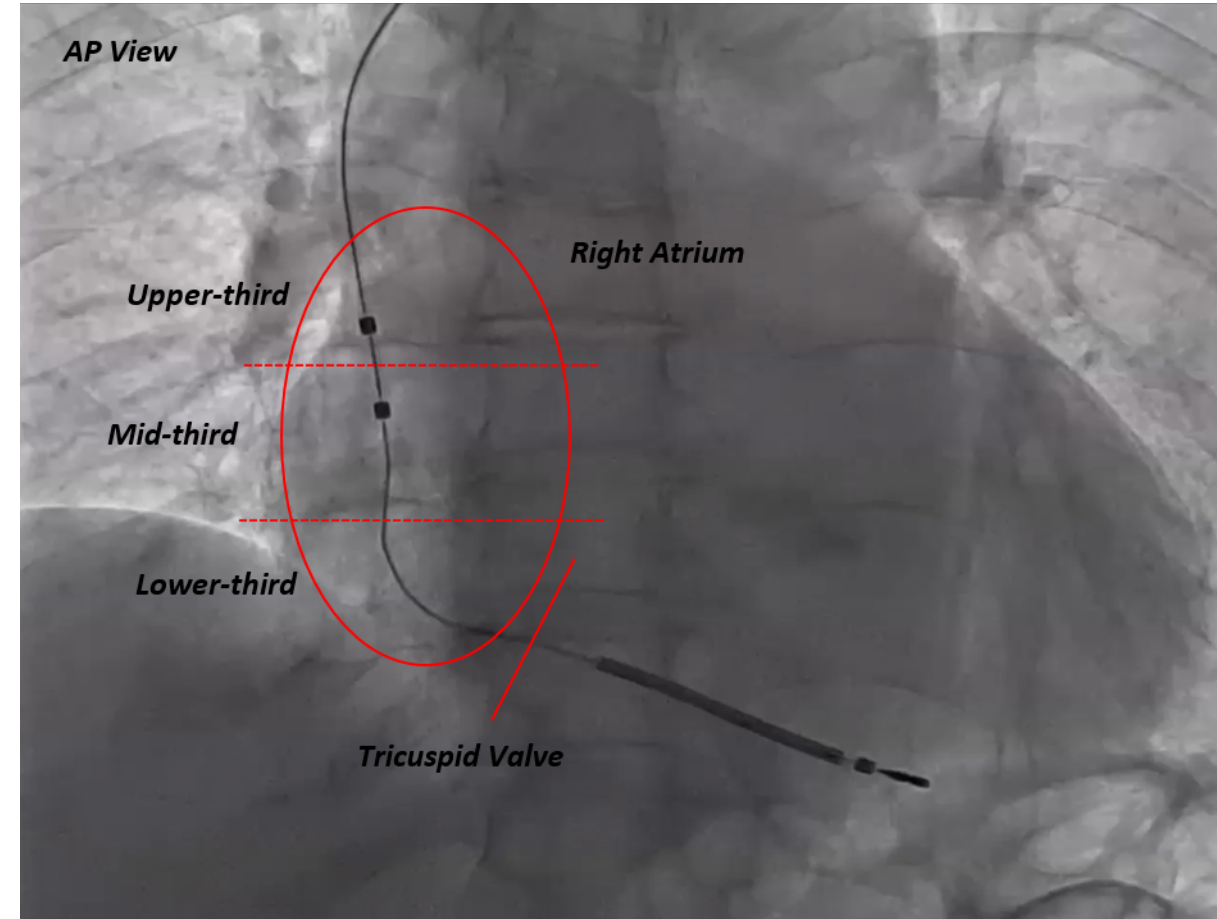
- When another lead (of any type) runs across the right atrium

How can we make sure noise won't be an issue?

- The floating atrial dipole of the DX lead should be well distant from the other lead

How could we tackle this event?

- Use different views, especially LAO



Art. 1
Art. 2
Art. 3
Art. 4
Art. 5
Art. 6
Art. 7
Art. 8
Art. 9
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Art. 100

"ASSOCIAZIONE PORTATORI DISPOSITIVI IMPIANTABILI CARDIACI"

A.P.D.I.C.

ASSOCIAZIONE DI VOLONTARIATO

STATUTO

Art. 1

Costituzione, denominazione e sede

È costituita con sede in Bologna (BO), presso Ciro Lomastro, Via S. Isaia n.6/3, e recapito operativo presso l'Istituto di Cardiologia, ambulatorio di Aritmologia, pad. 21, Via Massarenti, 9 - 40138 Bologna. L'Associazione di volontariato costituita ai sensi degli artt. 36 e seguenti del Codice Civile denominata "ASSOCIAZIONE PORTATORI DISPOSITIVI IMPIANTABILI CARDIACI" - in sigla A.P.D.I.C. La durata dell'Associazione è a tempo indeterminato; l'Associazione non ha scopo di lucro.

Art. 2

Scopi e finalità

20 novembre 2010



- Asse culturale e divulgativo

Diffusione della conoscenza della terapia con dispositivi impiantabili come base del patient empowerment, anche mediante la costituzione di un sito web attraverso il quale le persone interessate possano ottenere informazioni, scambiare esperienze personali, aggiornare le conoscenze sui dispositivi.

- Asse della ricerca

Azioni volte a favorire la comprensione delle necessità delle persone trattate con dispositivi impiantabili e la realizzazione di nuove tecnologie dirette a soddisfarle. Viene sostenuta la ricerca per migliorare la qualità di vita e orientare lo sviluppo tecnologico verso finalità di valore pratico ad alto impatto individuale e sociale.

Al fine di raggiungere gli scopi prefissati l'Associazione, inoltre, intende:

- promuovere o sostenere eventi divulgativi (conferenze, dibattiti, tavole rotonde, convegni, congressi e corsi di aggiornamento);
- finanziare o ricevere finanziamenti per le attività istituzionali promosse e gestite direttamente o da altri enti, istituzioni, strutture sanitarie e associazioni;
- condurre o sostenere, anche economicamente, studi e ricerche attinenti anche indirettamente il proprio scopo istituzionale;
- curare la pubblicazione di bollettini e di materiale informativo, in formato cartaceo o elettronico, per la diffusione più ampia ed efficace possibile delle informazioni utili per la promozione del benessere fisico, mentale e sociale dei pazienti portatori di dispositivi impiantabili;
- esercitare ogni altra attività che possa essere utile al raggiungimento degli scopi dell'Associazione.