Αμφικοιλιακή βηματοδότηση: προσφέρει κάτι στον άρρωστο?

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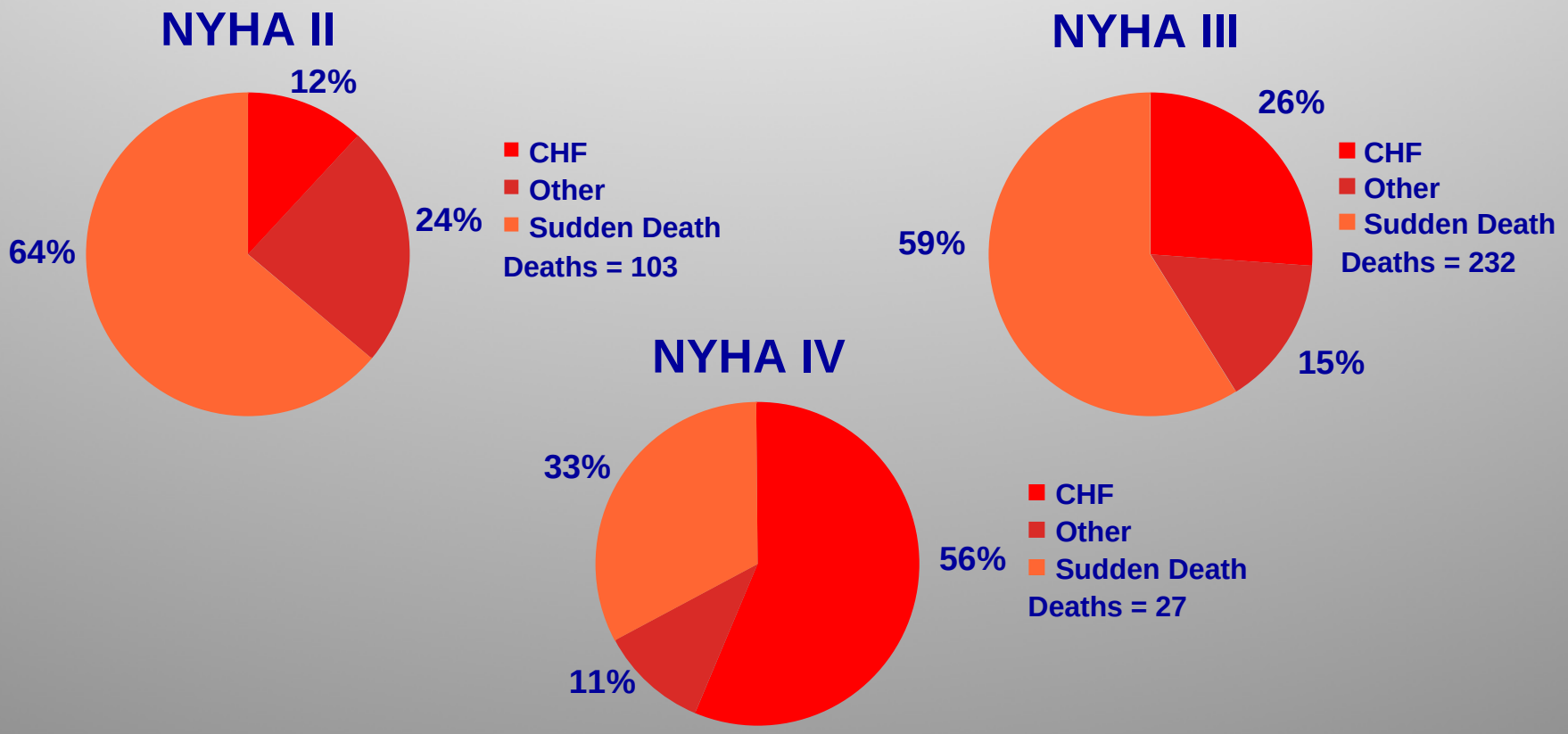
ΑΠΘ

- Αρρυθμικός θάνατος
- Καρδιακή ανεπάρκεια

SCD in Heart Failure

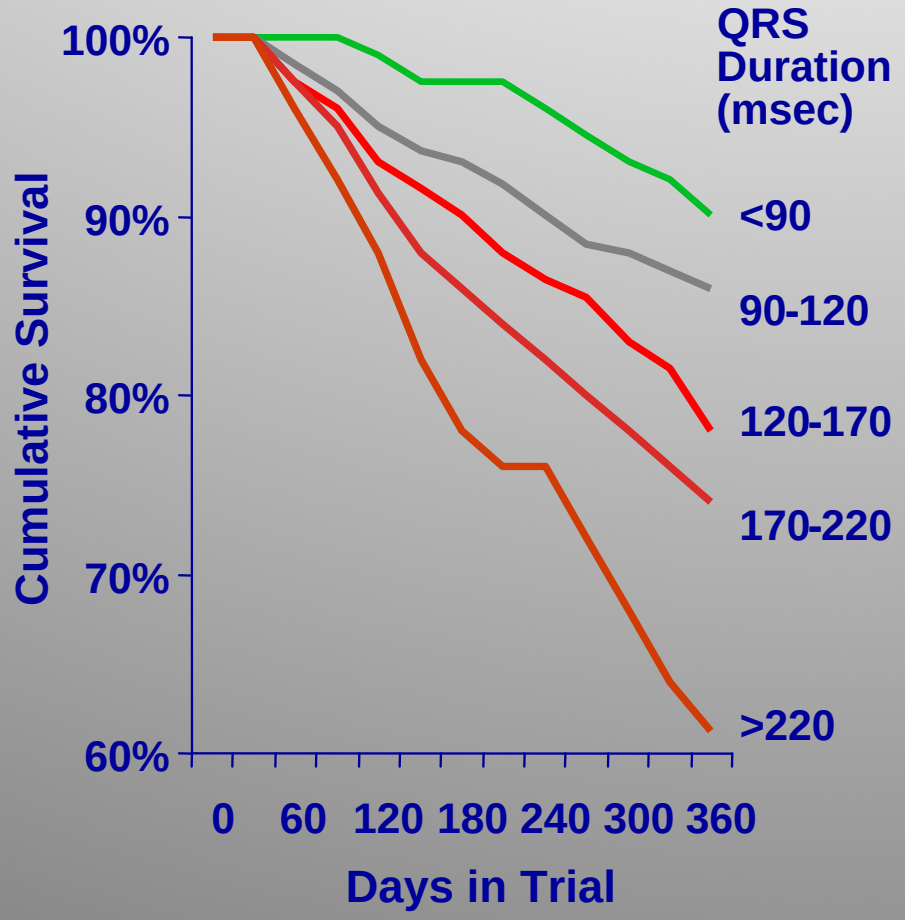
SCD–a prominent mode of death



MERIT-HF study group. Effect of metoprolol CR/XL in chronic heart failure: metoprolol CR/XL randomized intervention trial in congestive heart failure (MERIT-HF). *LANCET.* 1999;353:2005.

SCD in Heart Failure

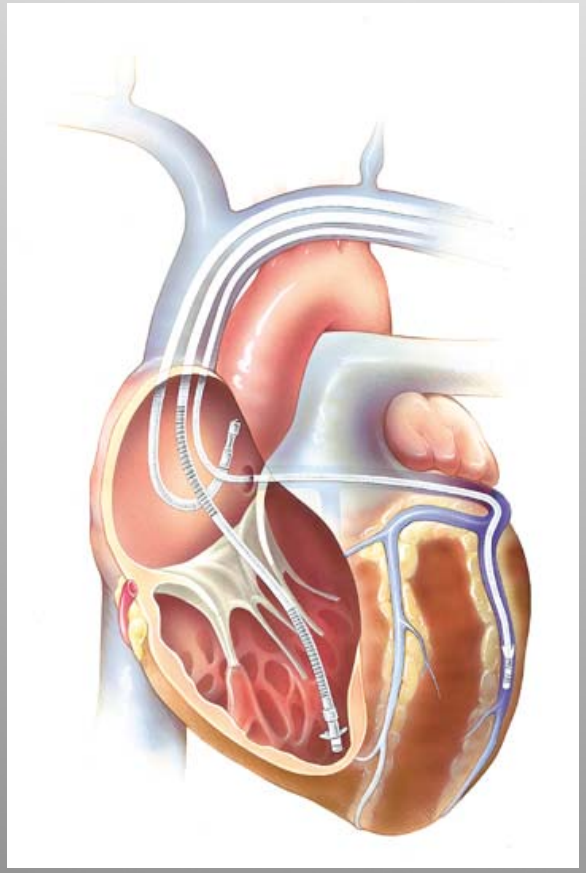
QRS complex and mortality



- VEST study analysis
- NYHA class II-IV
- 3,654 ECGs
- QRS duration was found to be an independent predictor of mortality

Adapted from V Gottipaty, MD.

τις «ηλεκτρικές» θεραπείες;

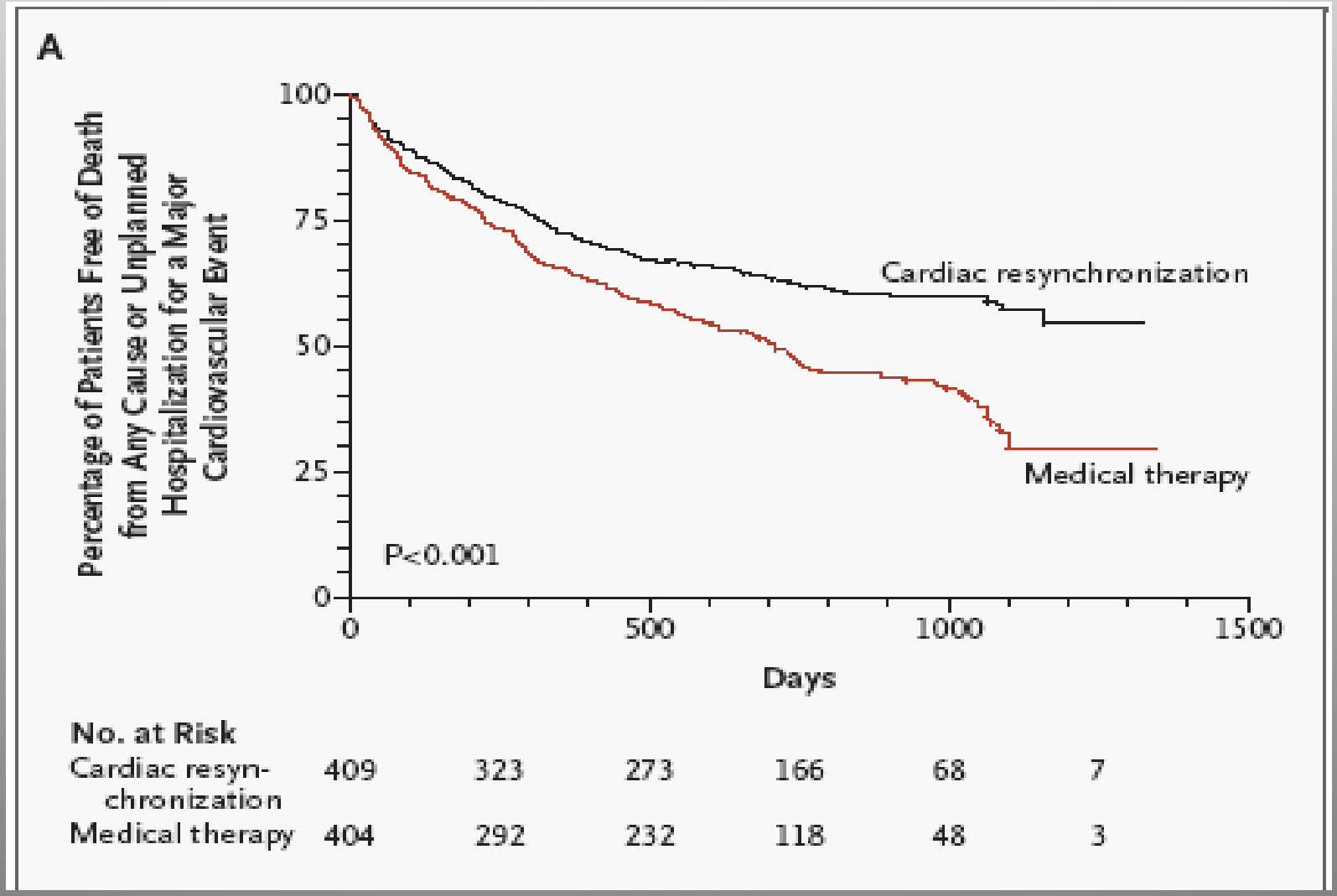


- Αμφικοιλιακή βηματοδότηση
- Τεχνολογία ICD

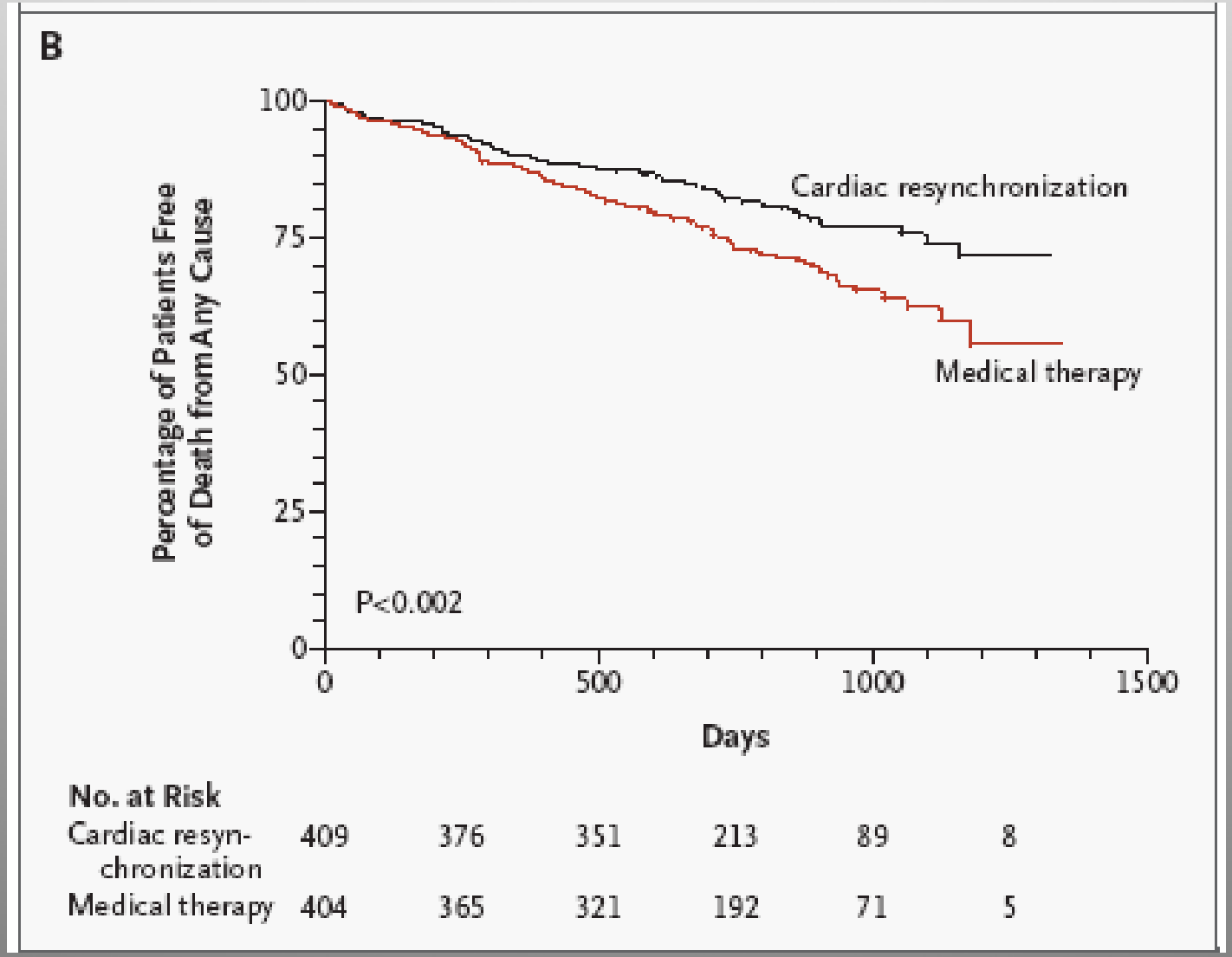
Απώτερα Αποτελέσματα Αμφικοιλιακής Βηματοδότησης

Study	*Number of Patients*	*Follow up (months)*	*Results*
French pilot	**50 NYHA III-IV**	**15.4 ± 10.2**	**↑ Peak VO2 ↓ NYHA class**
Insync	**103 NYHA III-IV**	**12**	**↓ NYHA class ↑ QOL ↑ Exercise tolerance**
Insync Italian Reg	**190 NYHA II-IV**	**10 ± 5**	**↓ NYHA class ↑ QOL ↑ Exercise tolerance**
PATH-CHF	**42 NYHA III-IV**	**3**	**↑ Peak VO2 ↑ QOL ↑ Exercise tolerance**
MUSTIC	**67 NYHA III**	**3/3**	**↑ Exercise tolerance ↑ Peak VO2 ↑ QOL**
MIRACLE	**266 NYHA III-IV**	**6**	**↑ Exercise tolerance ↑ Peak VO2 ↑ QOL**

CARE-HF: *death or hospitalization*



CARE-HF: *any death*



Longer-term effects of cardiac resynchronization therapy on mortality in heart failure [the CArdiac REsynchronization-Heart Failure (CARE-HF) trial extension phase]

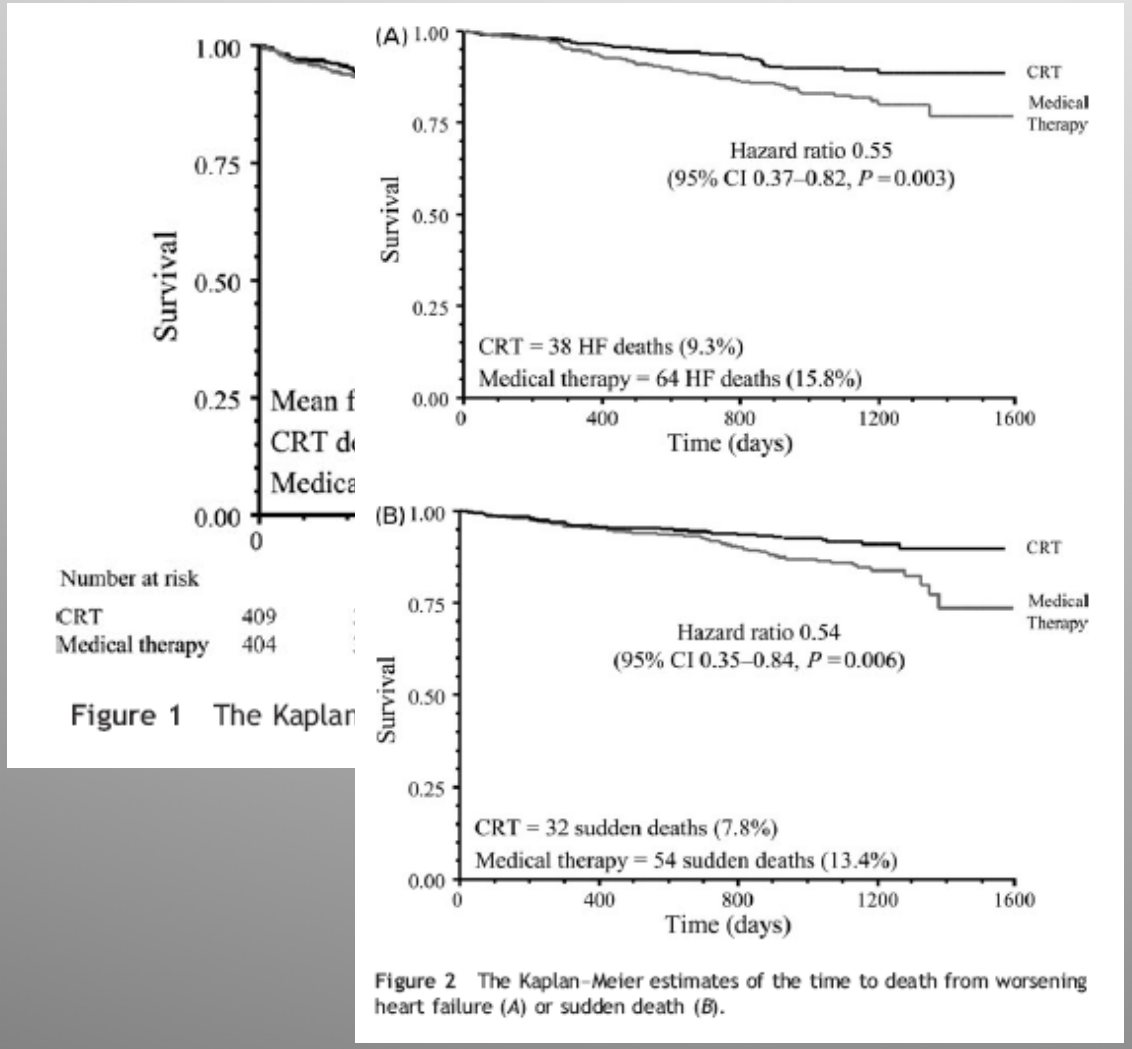


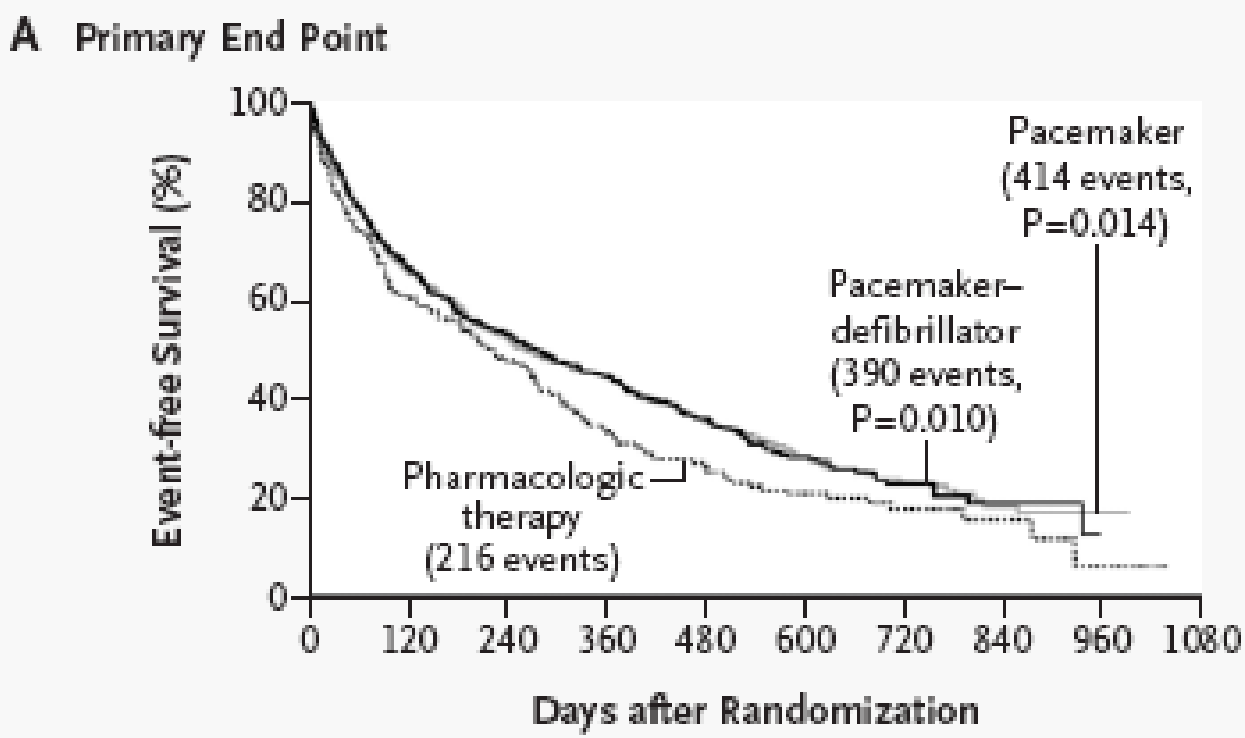
Figure 2 The Kaplan–Meier estimates of the time to death from worsening heart failure (*A*) or sudden death (*B*).

Additional 8 months F/U

Tot. mortality reduced due to both SCD and HF

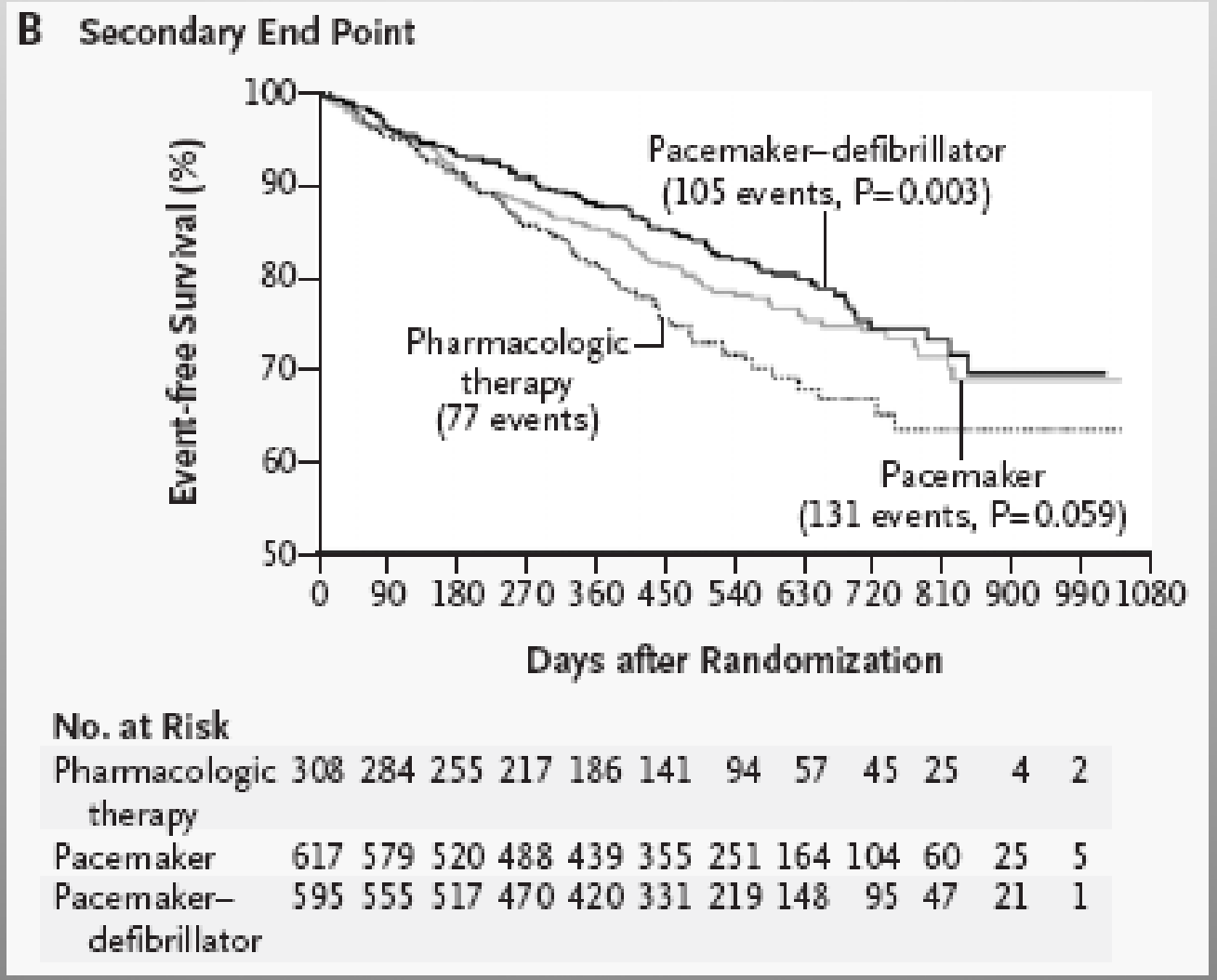
Cleland et al, EHJ 2006

COMPANION
(HF hospitalizations and death) *NEJM 2004*



No. at Risk									
Pharmacologic therapy	308	176	115	72	46	24	16	6	1
Pacemaker	617	384	294	228	146	73	36	14	3
Pacemaker–defibrillator	595	385	283	217	128	61	25	8	0

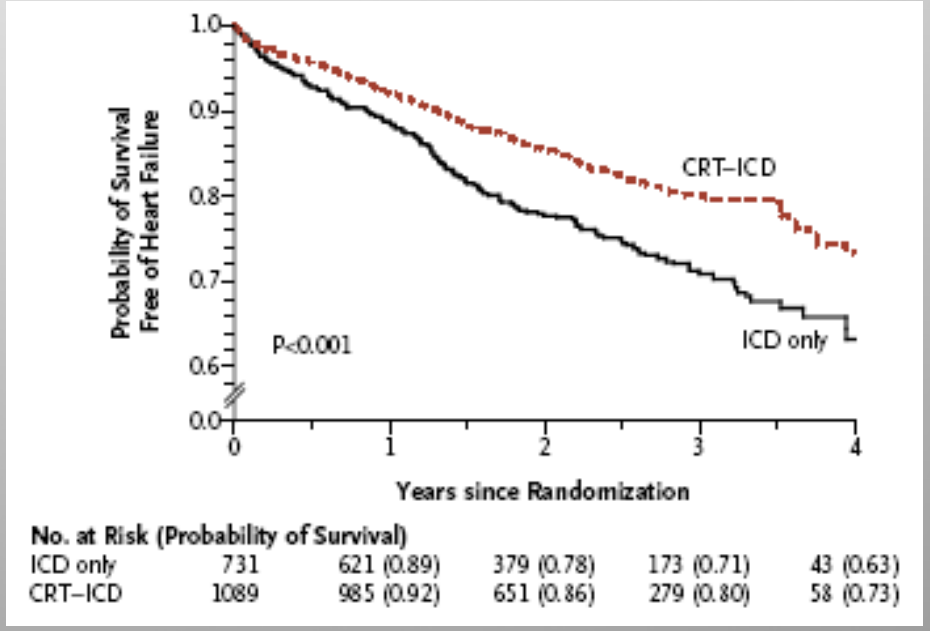
COMPANION
(Death from any cause) *NEJM 2004*



No. at Risk												
Pharmacologic therapy	308	284	255	217	186	141	94	57	45	25	4	2
Pacemaker	617	579	520	488	439	355	251	164	104	60	25	5
Pacemaker–defibrillator	595	555	517	470	420	331	219	148	95	47	21	1

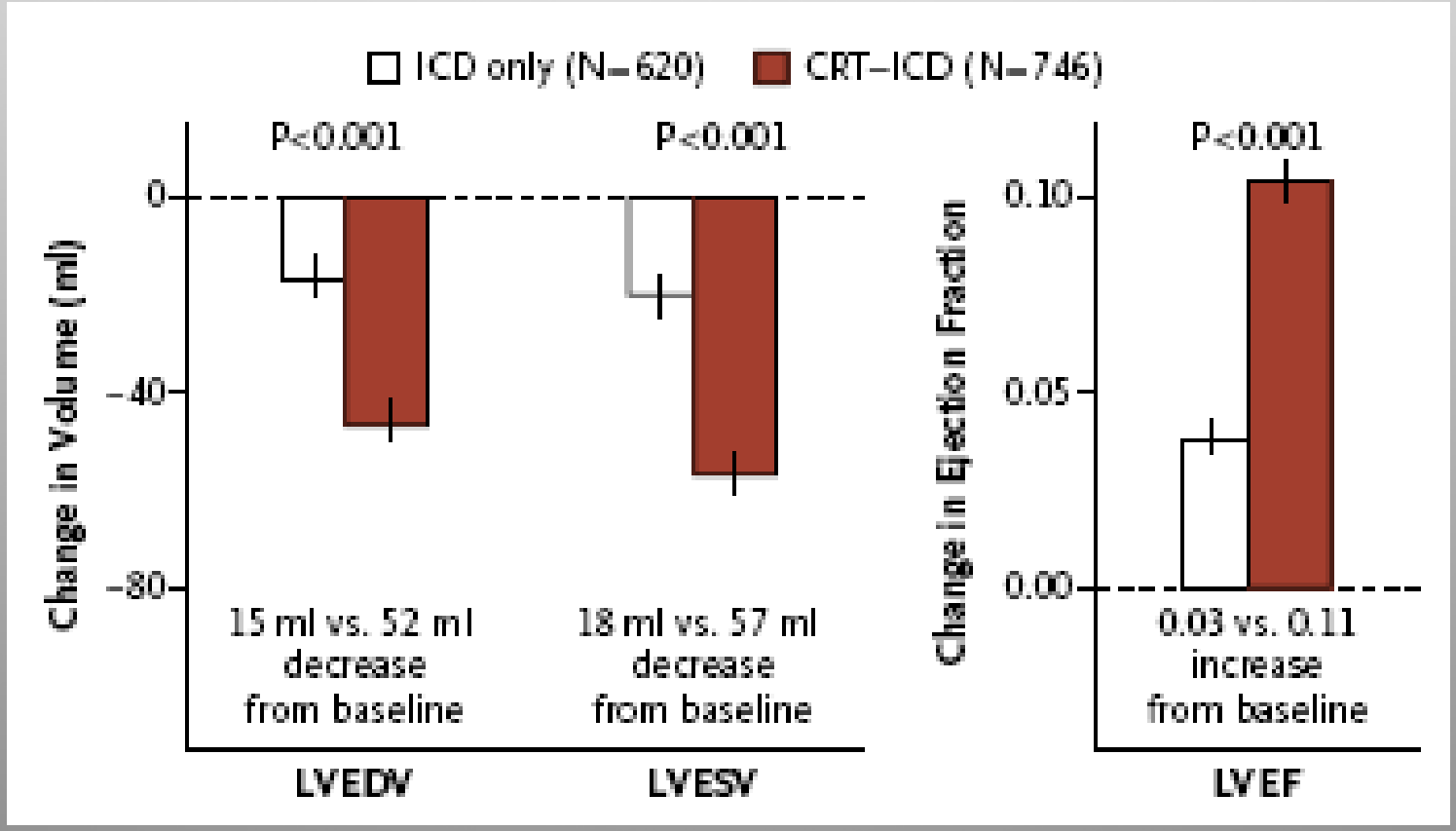
MADIT-CRT

- 1820 patients
- EF 30% or less,
- QRS duration 130 msec or more,
- Class I or II symptoms.



Moss et al N Eng J Med 2009

EF changes-LV reverse remodeling



Moss et al N Eng J Med 2009

- “NARROW” QRS pts with CHF
- Class II

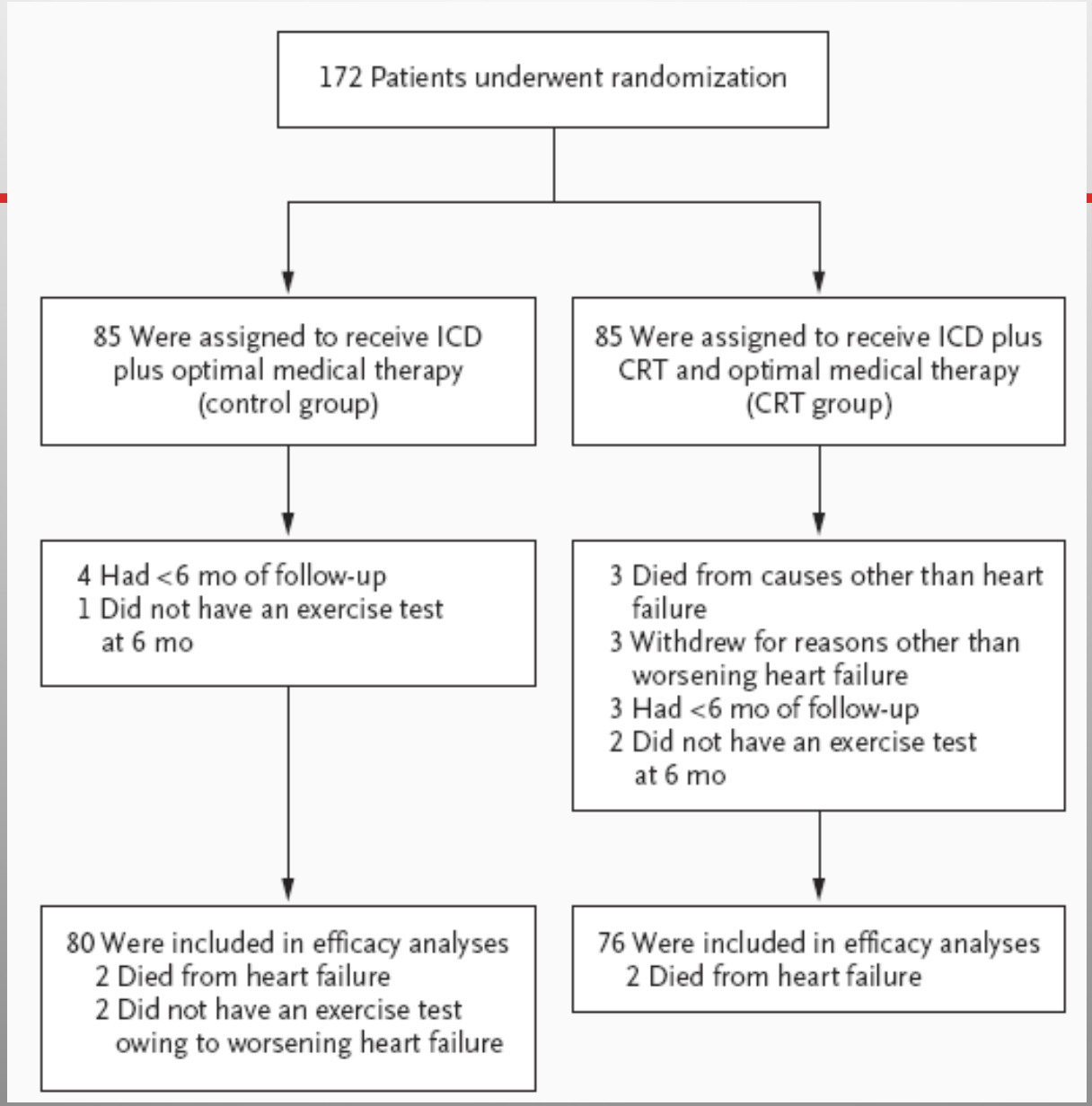
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

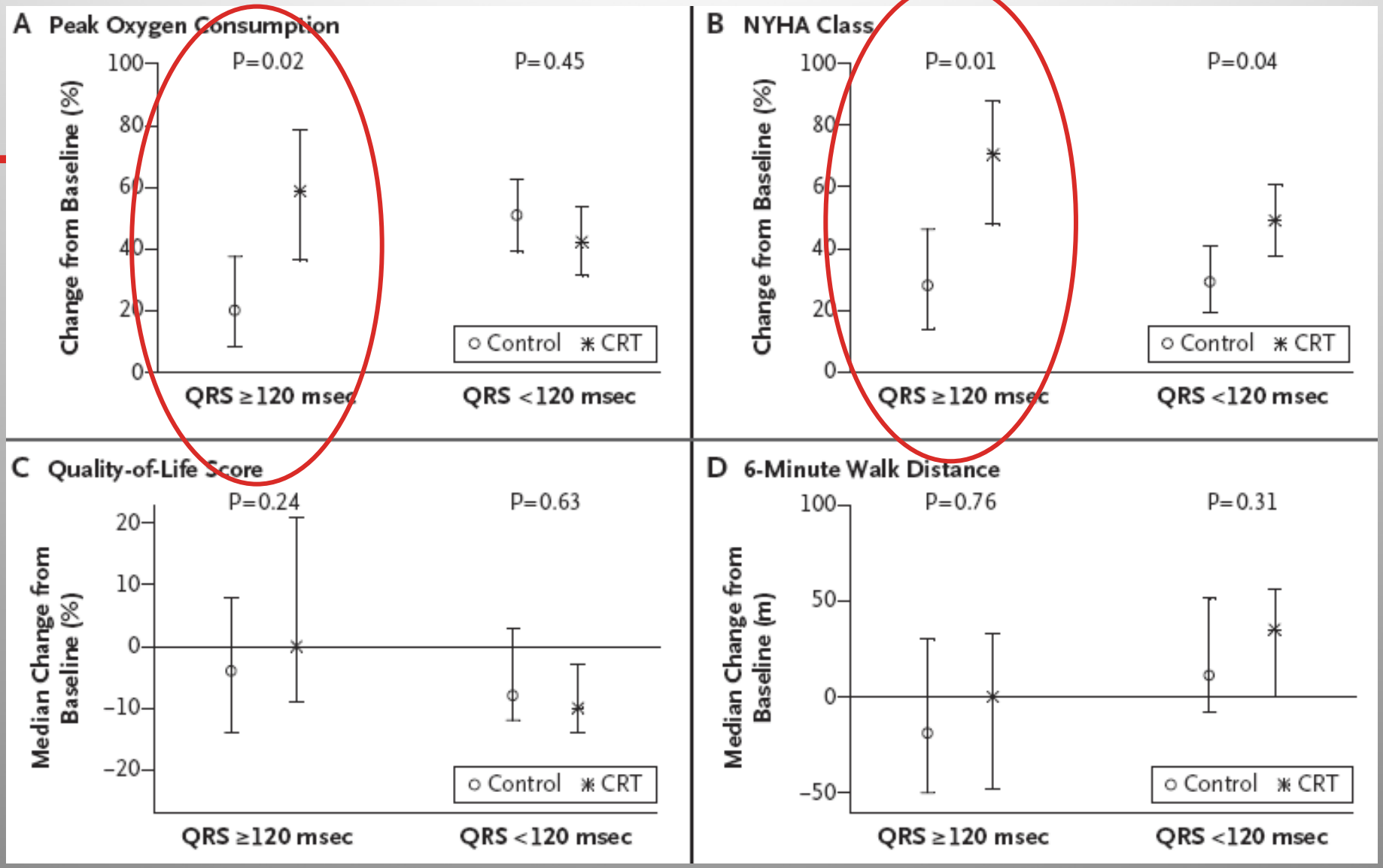
Cardiac-Resynchronization Therapy in Heart Failure with Narrow QRS Complexes

John F. Beshai, M.D., Richard A. Grimm, D.O., Sherif F. Nagueh, M.D., James H. Baker II, M.D., Scott L. Beau, M.D., Steven M. Greenberg, M.D., Luis A. Pires, M.D., and Patrick J. Tchou, M.D., for the RethinQ Study Investigators*

- ICD indication
- EF<35%
- Class III
- QRS <130ms
- Mechanical asynchrony on echo



RethinQ Trial, Beshai et al ,NEJM 2007



RethinQ Trial, Beshai et al ,NEJM 2007

REVERSE Trial

Inclusion Criteria

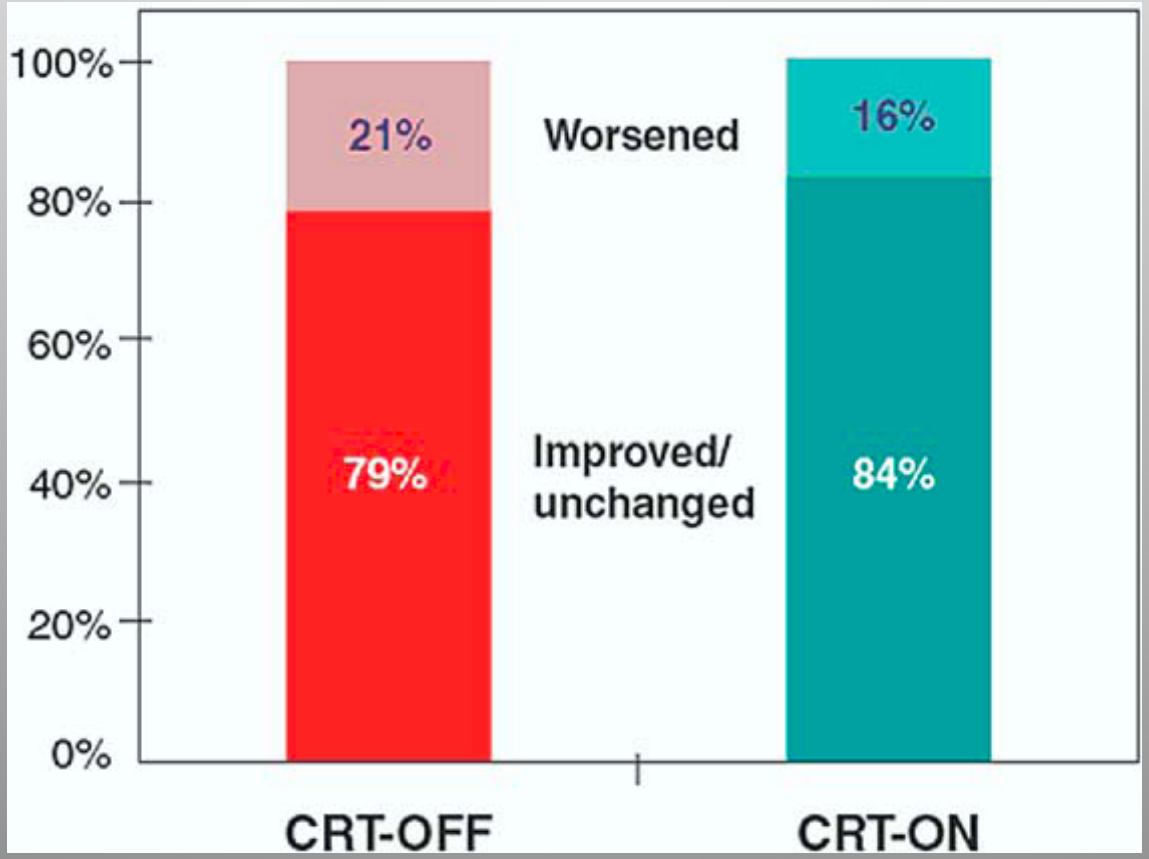
- NYHA Class II or I (previously symptomatic)
- QRS ≥ 120 ms
- LVEF ≤ 40%; LVEDD ≥ 55 mm
- Optimal medical therapy (OMT)
- Without permanent cardiac pacing
- With or without an ICD indication

REVERSE Trial

End Points

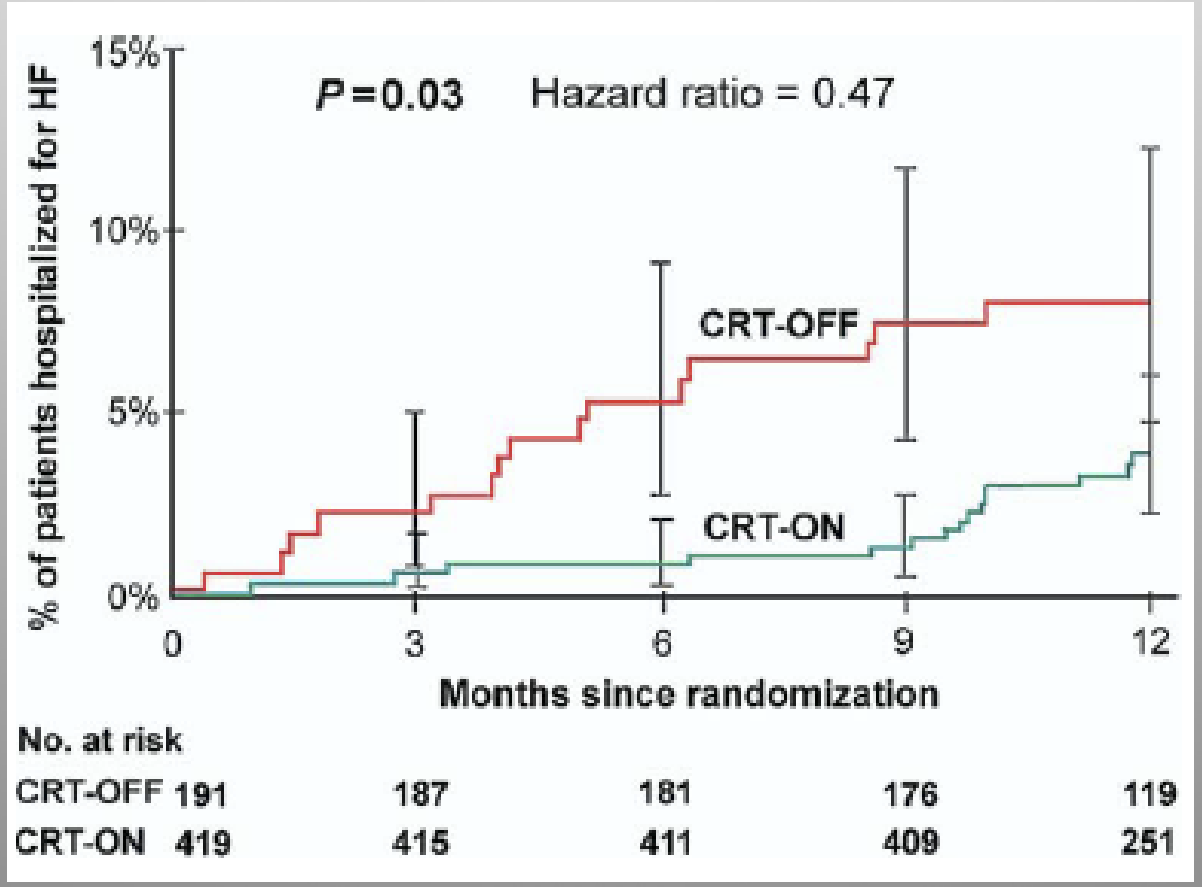
- Primary: HF Clinical Composite Response,
  comparing the proportion of patients worsened in CRT OFF vs. CRT ON groups
  - Composite includes: all-cause mortality, HF hospitalizations, crossover due to worsening HF, NYHA class, and the patient global assessment assessed in double blind manner
- Prospectively Powered Secondary:
  LV End Systolic Volume Index (LVESVi)
  comparing CRT OFF vs. CRT ON subjects
  - LVESVi assessed by core labs (1 in Europe, 1 in U.S)

REVERSE Trial



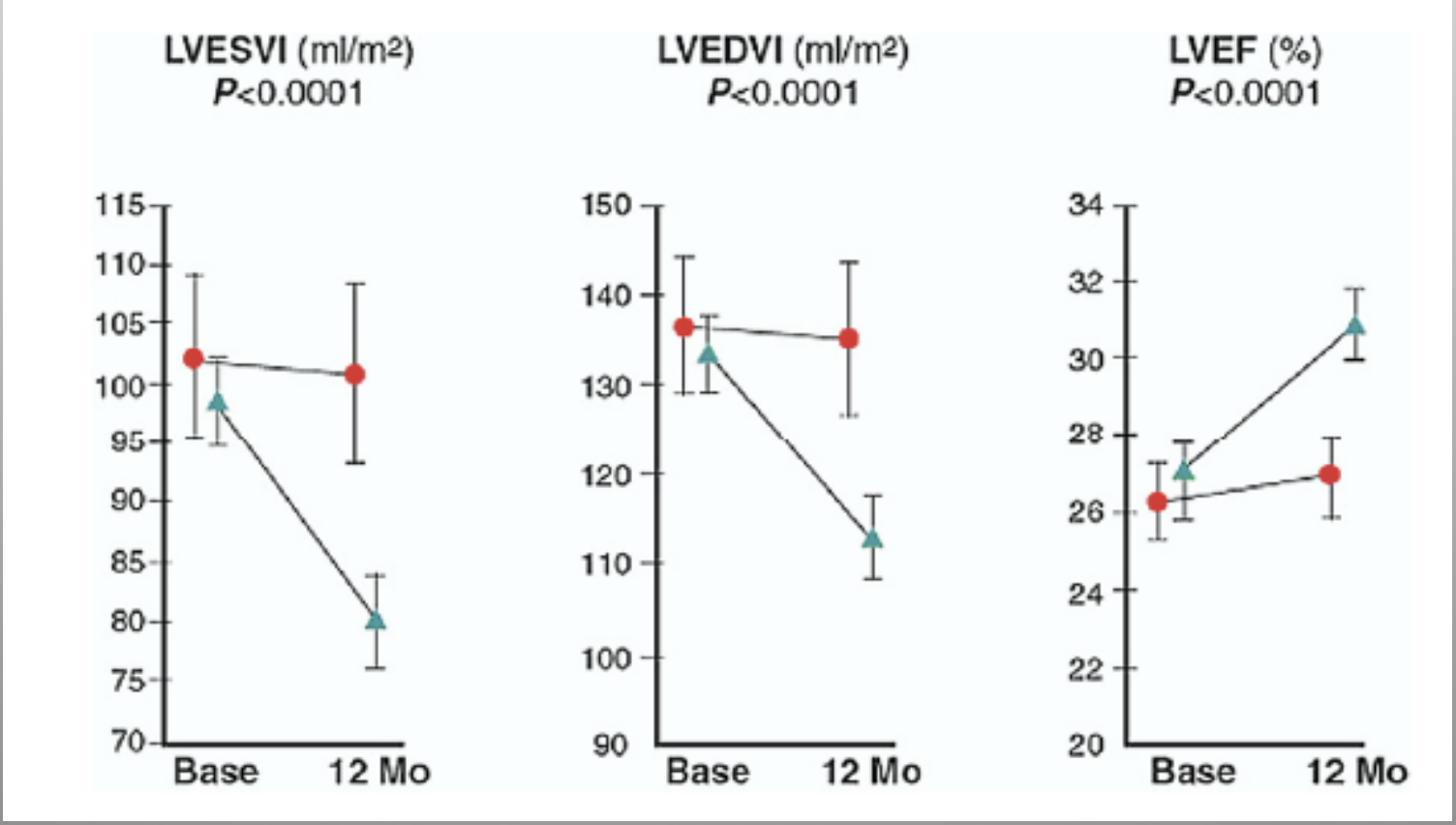
Linde et al, JACC 2008

Time to First Heart Failure Hospitalization in the First 12 Months



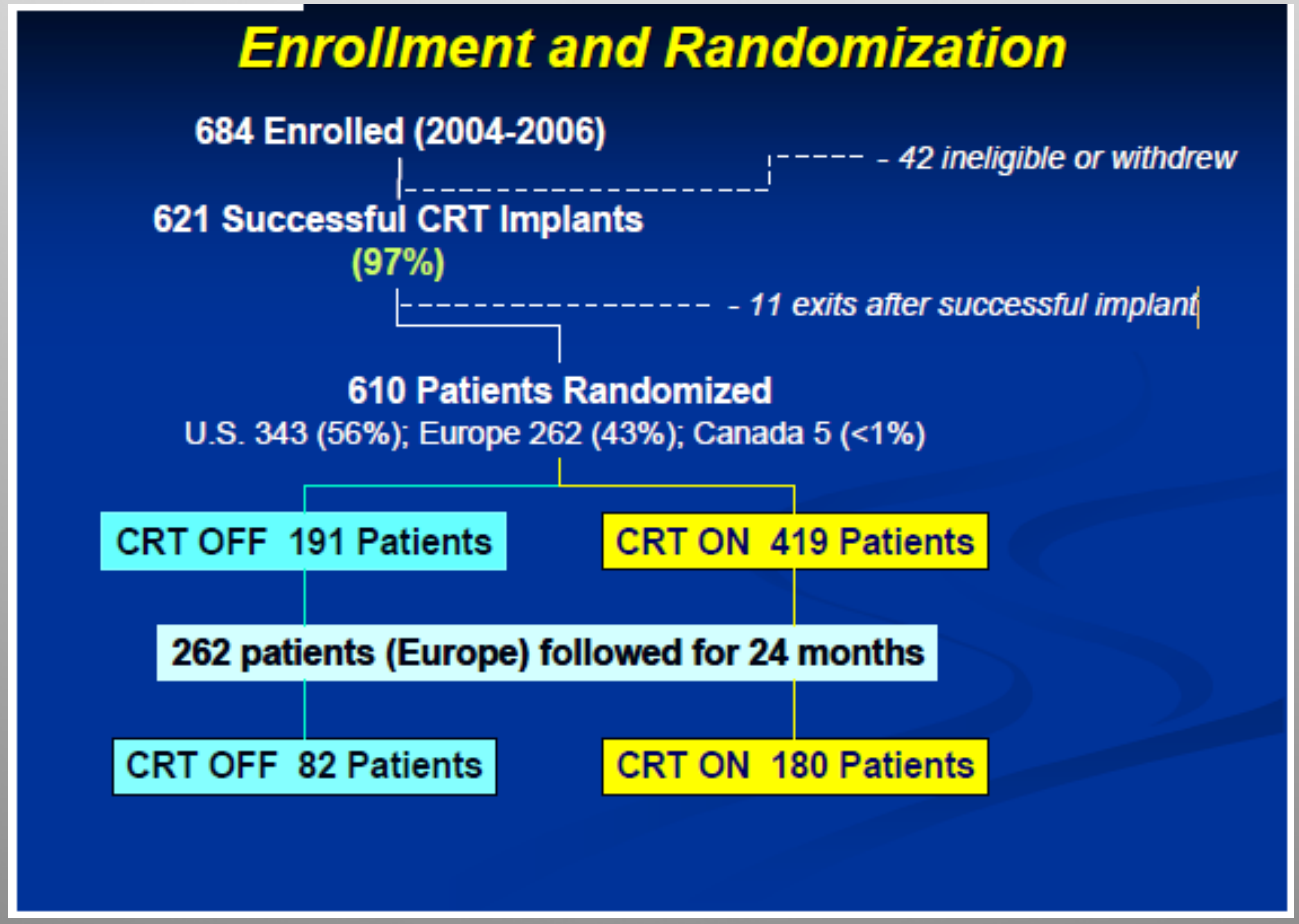
Linde et al, JACC 2008

Mean LVESVI, LVEDVI, and LVEF at Baseline and 12 Months

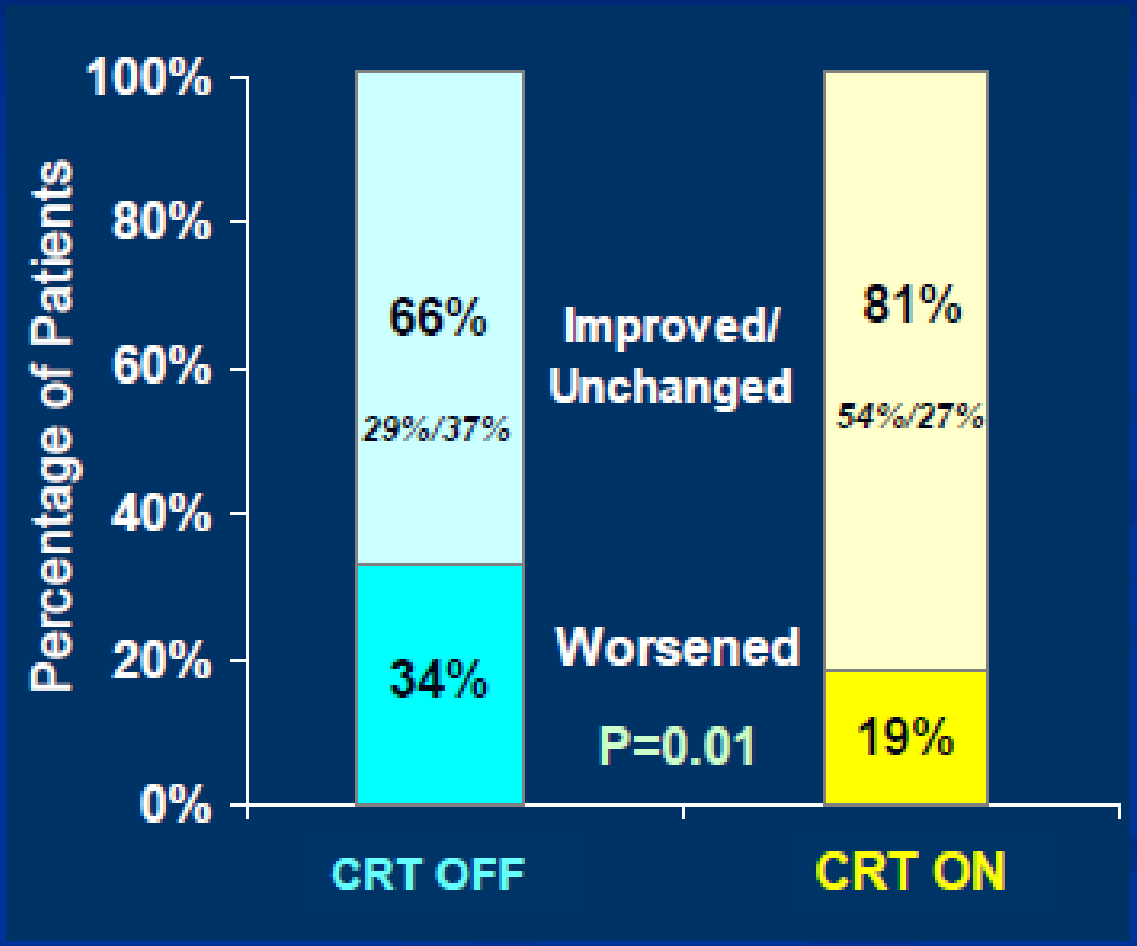


Linde et al, JACC 2008

REVERSE Trial –European f/u

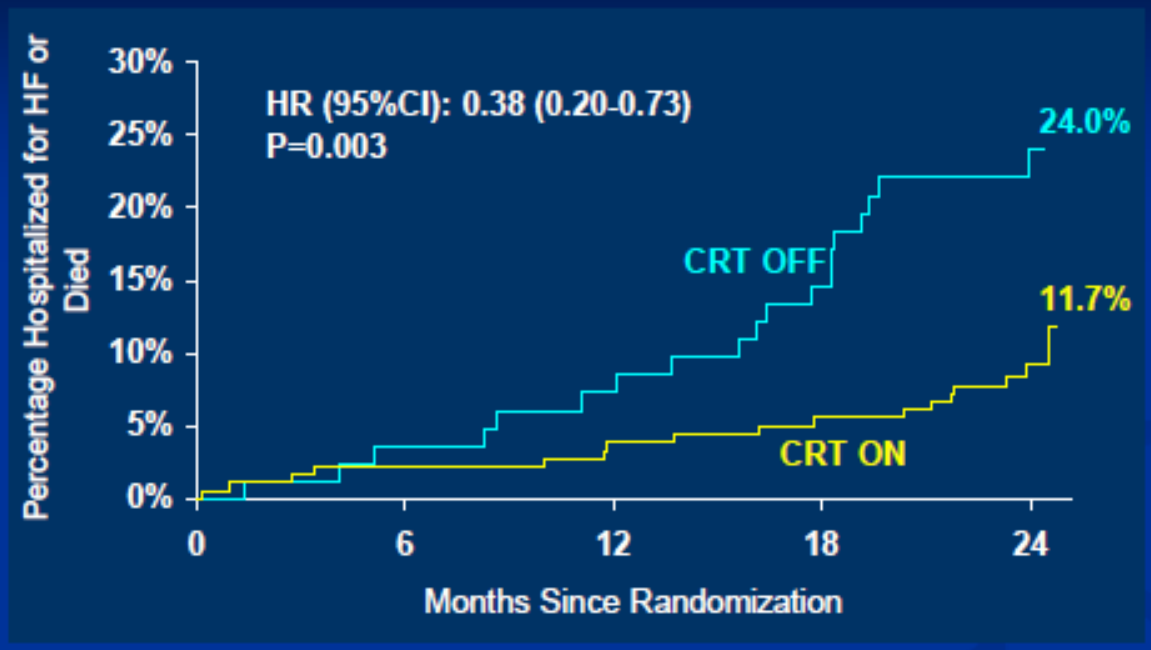


Primary End Point: Clinical Composite Response



Entire distribution analysis of worsened, unchanged and improved: P=0.0006

Time to First HF Hospitalization or Death



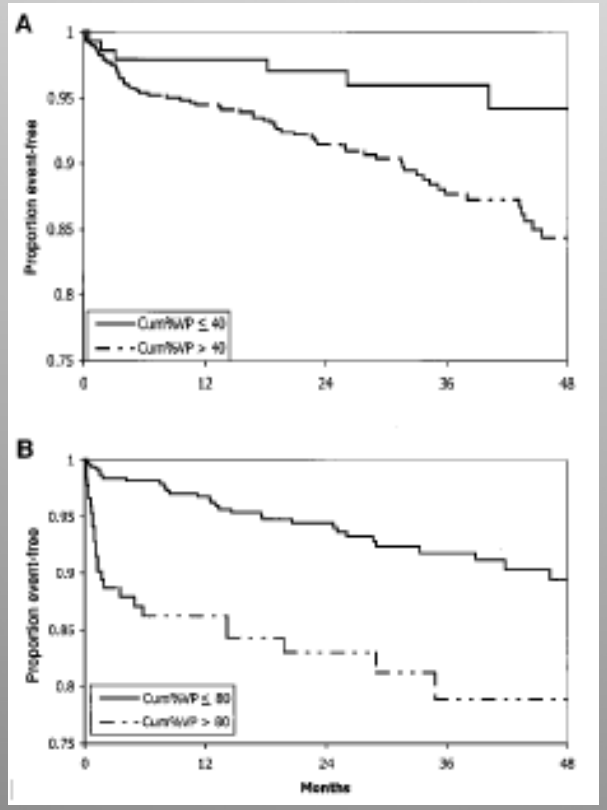
Number at Risk					
CRT OFF	82	79	76	70	39
CRT ON	180	176	173	168	77

MOde Selection Trial

Cumulative percent ventricular paced

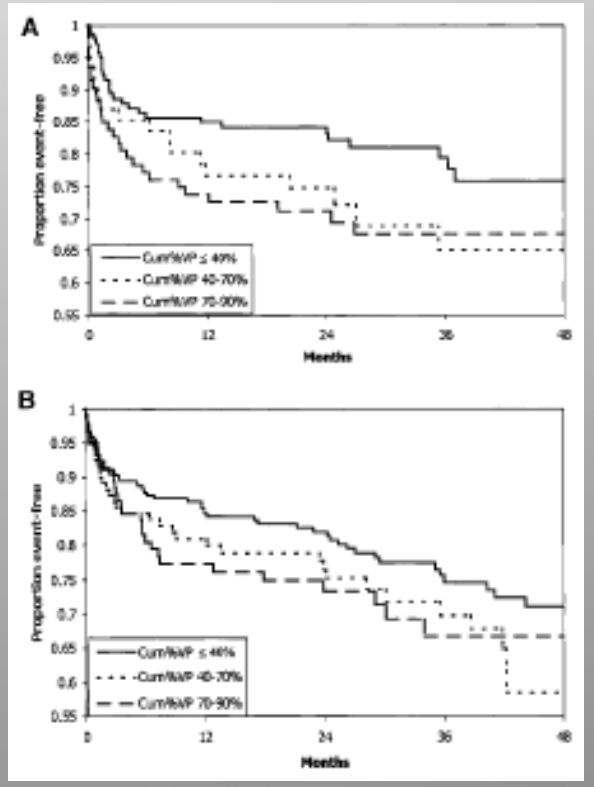
HF hospitalizations

AF occurence



DDDR

VVIR



Sweeney et al, Circulation 2003;107:2932-37

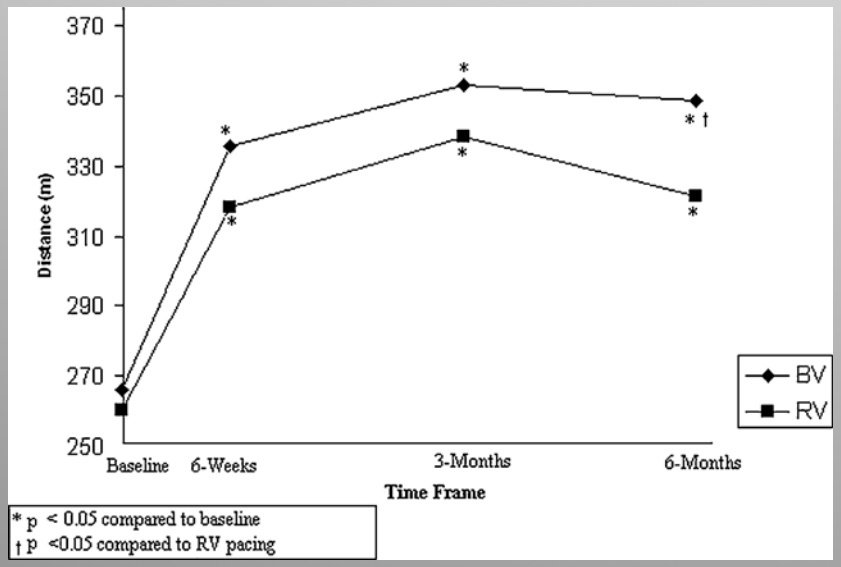
Post AVnodal ablation Evaluation

- AVN RFA for AF (*EF 46%, NYHA class II, III)*
- 103 pts BIV
- 81 pts RV
- 6-mins walking test
- Quality of life
- LVEF

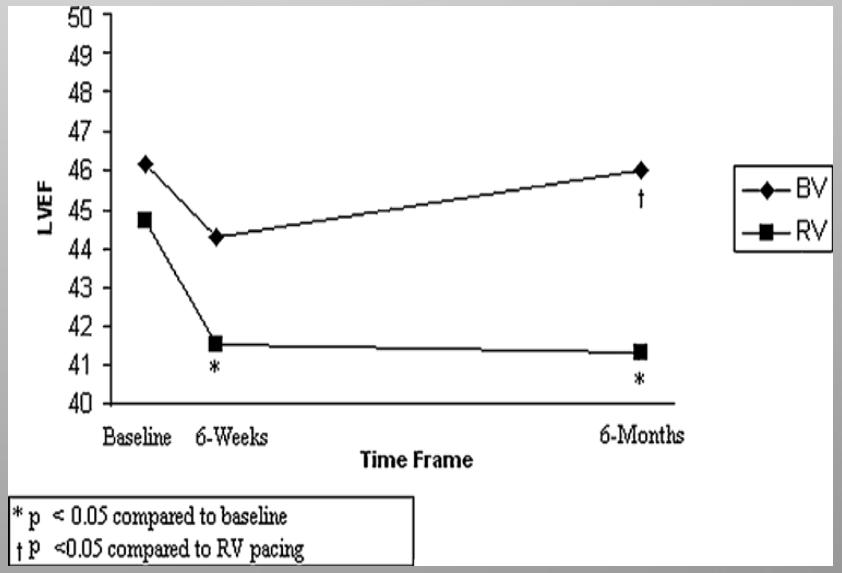
Doshi et al, 2005 J Cardiovasc Electrophysiol 16:1160-5

Post AVnodal ablation Evaluation

Walking distance

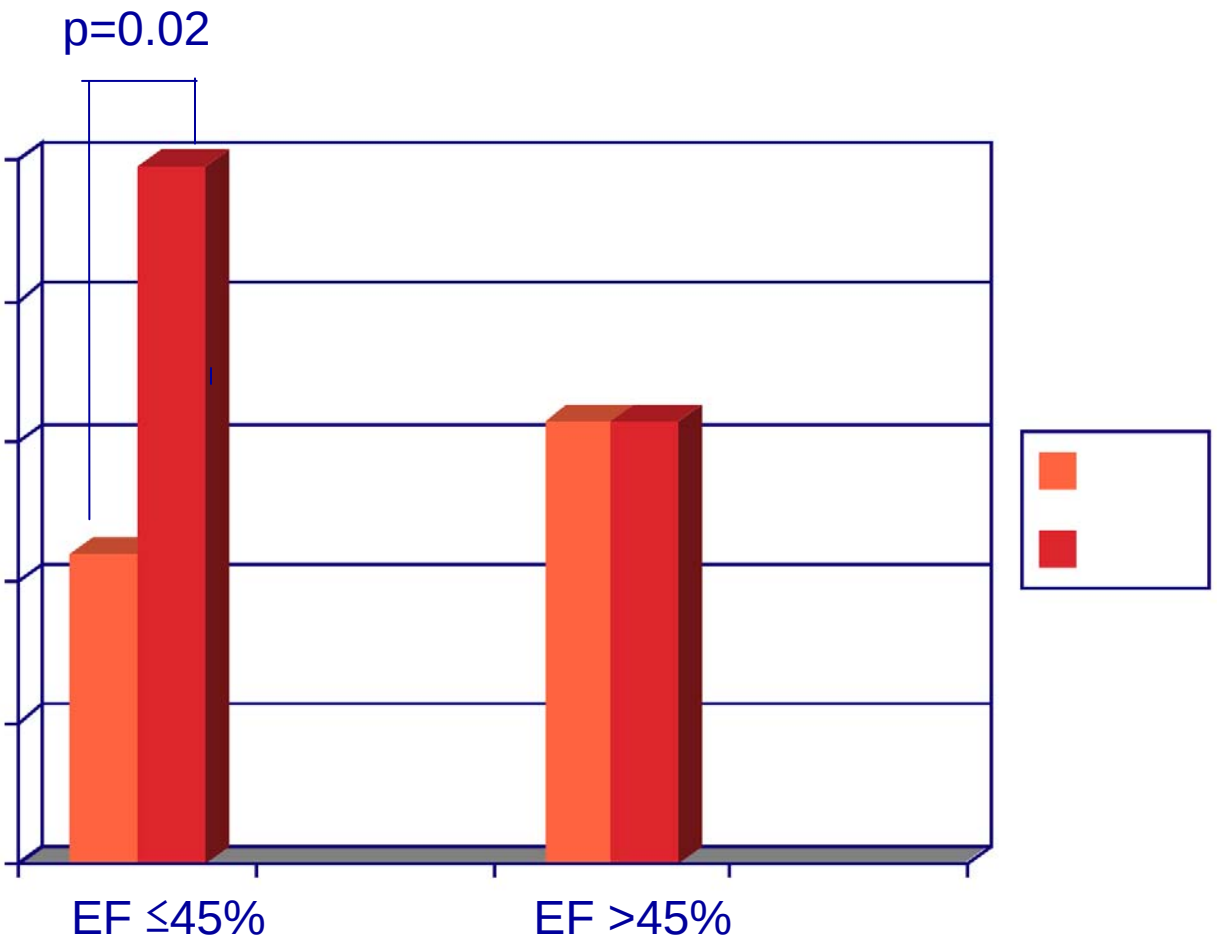


LVEF



Doshi et al, 2005 J Cardiovasc Electrophysiol 16:1160-5

Improvement in (m), Stratified by EF



Greater improvement in low EF patients: BiV vs. RV

Long-Term Prognosis After Cardiac Resynchronization Therapy Is Related to the Extent of Left Ventricular Reverse Remodeling at Midterm Follow-Up

Claudia Ypenburg, MD,* Rutger J. van Bommel, MD,* C. Jan Willem Borleffs, MD,* Gabe B. Bleeker, MD, PHD,* Eric Boersma, PHD,† Martin J. Schalij, MD, PHD,* Jeroen J. Bax, MD, PHD*

Leiden and Rotterdam, the Netherlands

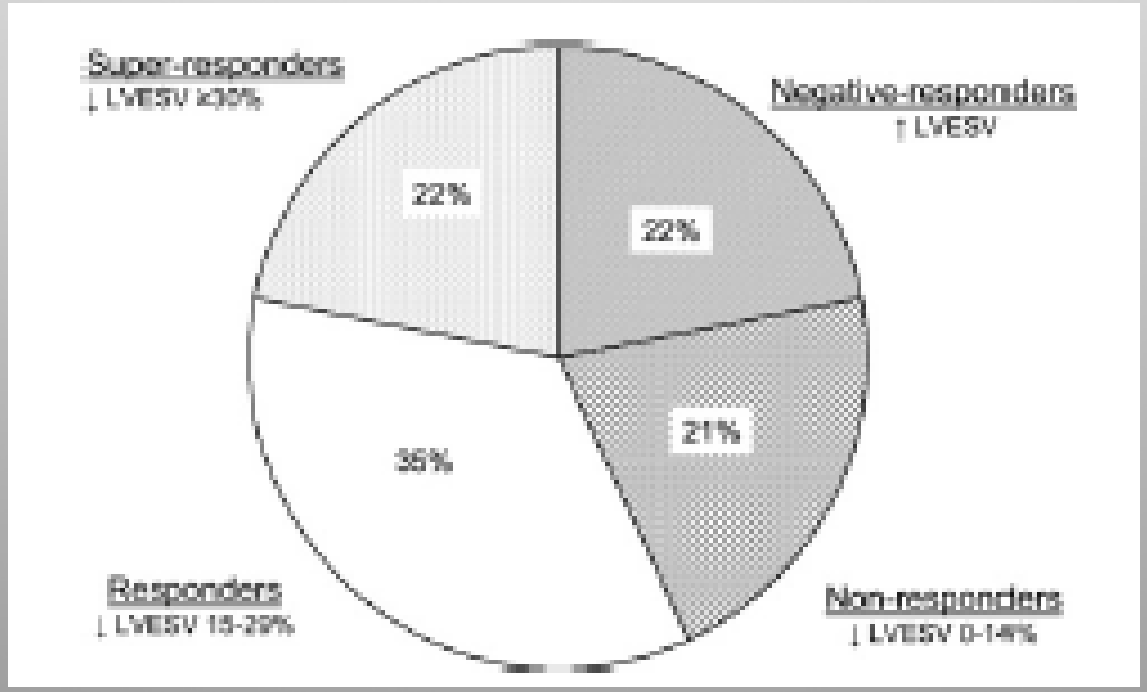
Objectives The aim of the current study was to evaluate the relation between the extent of left ventricular (LV) reverse remodeling and clinical/echocardiographic improvement after 6 months of cardiac resynchronization therapy (CRT) as well as long-term outcome.

Background Despite the current selection criteria, individual response to CRT varies significantly. Furthermore, it has been suggested that reduction in left ventricular end-systolic volume (LVESV) after CRT is related to outcome.

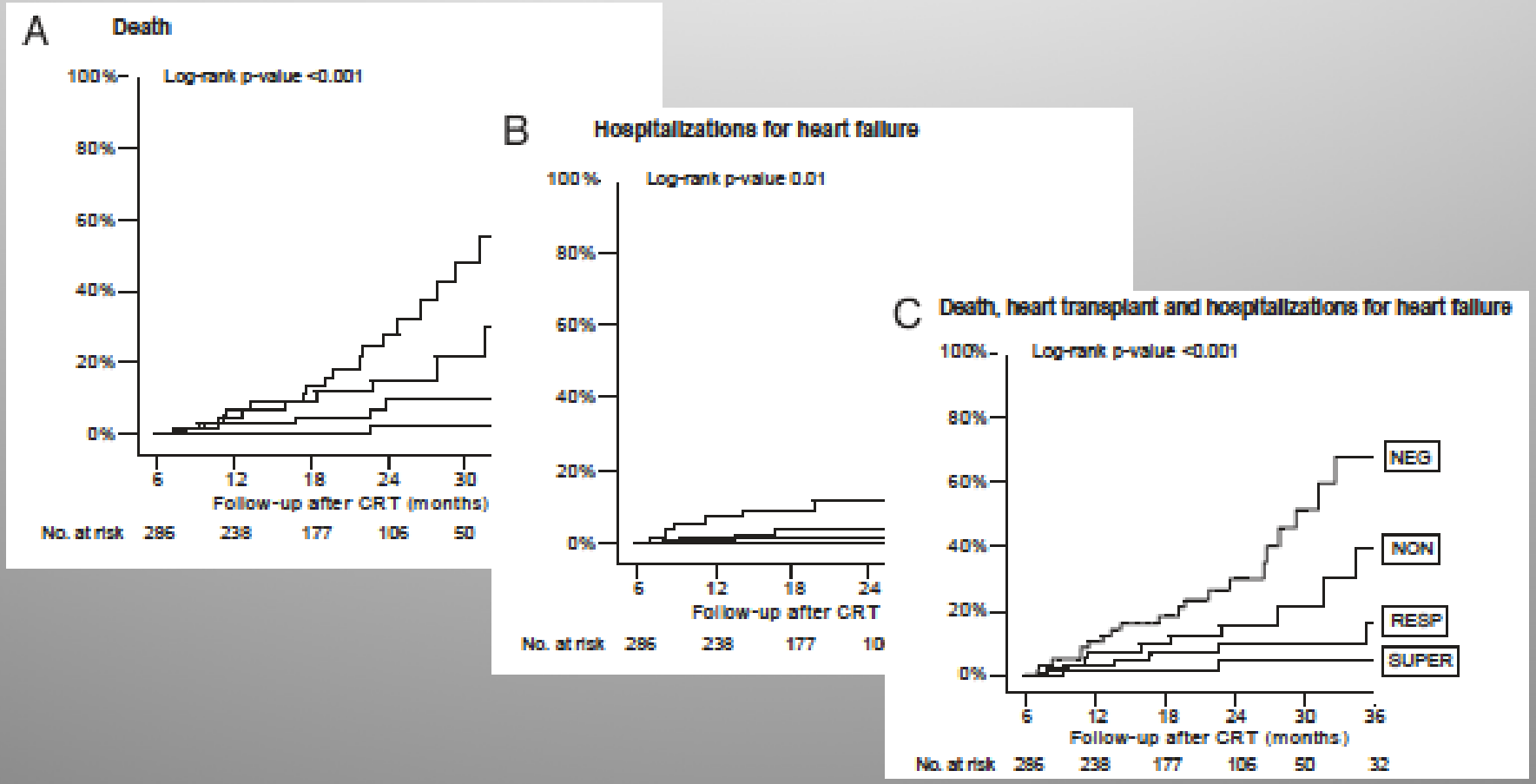
Methods A total of 302 CRT candidates were included. Clinical status and echocardiographic evaluation were performed before implantation and after 6 months of CRT. Long-term follow-up included all-cause mortality and hospitalizations for heart failure.

Results Based on different extents of LV reverse remodeling, 22% of patients were classified as super-responders (decrease in LVESV ≥30%), 35% as responders (decrease in LVESV 15% to 29%), 21% as nonresponders (decrease in LVESV 0% to 14%), and 22% negative responders (increase in LVESV). More extensive LV reverse remodeling resulted in more clinical improvement, with a larger increase in LV function and more reduction in mitral regurgitation. In addition, more LV reverse remodeling resulted in less heart failure hospitalizations and lower mortality during long-term follow-up (22 ± 11 months); 1- and 2-year hospitalization-free survival rates were 90% and 70% in the negative responder group compared with 98% and 96% in the super-responder group (log-rank p value <0.001).

Conclusions The extent of LV reverse remodeling at midterm follow-up is predictive for long-term outcome in CRT patients. (J Am Coll Cardiol 2009;53:483–90)



Ypenburg,… Bax, JACC 2009

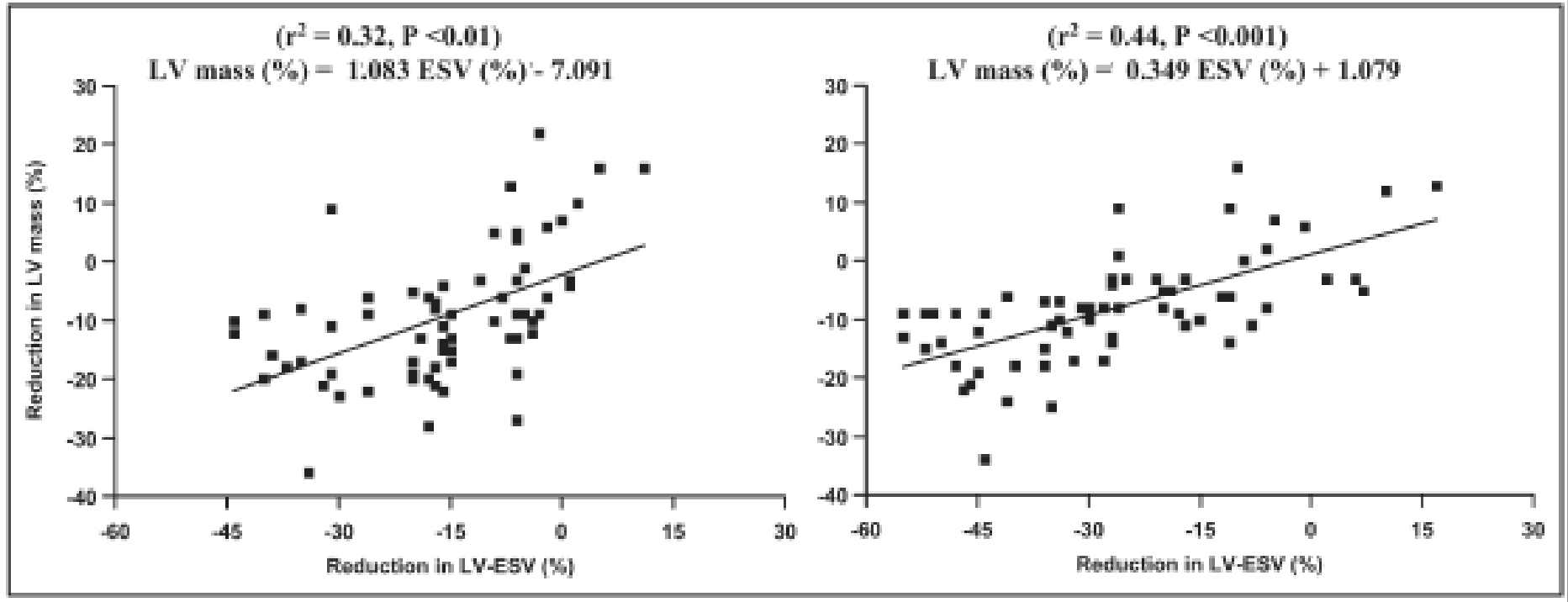


Ypenburg,… Bax, JACC 2009

Reverse of Left Ventricular Volumetric and Structural Remodeling in Heart Failure Patients Treated With Cardiac Resynchronization Therapy

Osama I.I. Soliman, MD[a,b], Marcel L. Geleijnse, MD, PhD[a], Dominic A.M.J. Theuns, PhD[a], Attila Nemes, MD, PhD[a], Wim B. Vletter, MSc[a], Bas M. van Dalen, MD[a], Ahmed K. Motawea, MD[b], Luc J. Jordaens, MD, PhD[a], and Folkert J. ten Cate, MD, PhD[a,*]

Patients with heart failure and mechanical dyssynchrony suffer a progressive increase in left ventricular (LV) mass and asymmetrical regional hypertrophy with eventual poor prognosis. The present study sought to investigate whether cardiac resynchronization therapy (CRT) could reverse these abnormalities. The study included 66 consecutive heart failure patients who received CRT. All patients underwent serial evaluation before, 3 months after, and 12 months after CRT. At 12 months after CRT, 50 patients (76%) were echocardiographic volumetric responders, defined as a >15% reduction in LV end-systolic volume. LV end-systolic volume was decreased from 214 ± 97 ml to 179 ± 88 ml at 3 months and was further decreased to 158 ± 86 ml at 12 months after CRT (all $p < 0.01$). LV ejection fraction was improved from 18% ± 4% to 28% ± 7% ($p < 0.001$) at 3 months without further change at 12 months after CRT. LV mass was reduced from 242 ± 52 g to 222 ± 45 g at 3 months and was further reduced to 206 ± 50 g at 12 months after CRT (all $p < 0.01$). Improvement of LV geometry was seen as improvements of the end-diastolic (1.64 ± 0.14 vs 1.77 ± 0.17, $p < 0.001$) and the end-systolic (1.63 ± 0.14 vs 1.99 ± 0.22, $p < 0.001$) sphericity indexes, respectively, at 3 months, without further significant changes at 12 months after CRT. Volumetric responders had a reduction in LV mass from 240 ± 50 to 210 ± 38 at 3 months, and LV mass was further reduced to 186 ± 37 g at 12 months after CRT (all $p < 0.01$). In contrast, nonresponders had a progressive increase in LV mass from 248 ± 59 g to 258 ± 54 g at 3 months, and LV mass was further increased to 269 ± 60 g at 12 months after CRT (all $p < 0.05$). Likewise, only in volumetric responders, regression of the asymmetric hypertrophy of the lateral wall was noted. In conclusion, CRT results in not only volumetric improvement but also in true reverse LV structural remodeling, evidenced by progressive reduction in LV mass and restoration of regional wall symmetry. (Am J Cardiol 2008;101:651–657)



Soliman et al, AmJ Card 2008

Effects of Interruption of Long-Term Cardiac Resynchronization Therapy on Left Ventricular Function and Dyssynchrony

Claudia Ypenburg, MD, Rutger J. Van Bommel, MD, Nina Ajmone Marsan, MD, Victoria Delgado, MD, Gabe B. Bleeker, MD, PhD, Ernst E. van der Wall, MD, PhD, Martin J. Schalij, MD, PhD, and Jeroen J. Bax, MD, PhD*

Interruption of short-term cardiac resynchronization therapy (CRT) has been shown to acutely worsen left ventricular (LV) function, mitral regurgitation, and LV dyssynchrony. The present study aims to assess whether LV reverse remodeling influences interruption of CRT, and, more practically, whether long-term continuous pacing is necessary in patients with reverse LV remodeling. A total of 135 recipients of CRT were selected after showing LV reverse remodeling defined as a decrease in LV end-systolic volume ≥15% after 6 months of CRT ("responders"). Echocardiography was performed at baseline and after 6 months with intermittent CRT on and off. LV dyssynchrony was determined using tissue Doppler imaging. During interruption of CRT, an acute deterioration in LV function, mitral regurgitation, and LV desynchronization were noted in responder patients. Of note, worsening of these echocardiographic measurements was observed, but they did not return to baseline values. For comparison, 100 nonresponder patients (without LV reverse remodeling) showed no significant echocardiographic changes during interruption. In conclusion, despite the presence of LV reverse remodeling, interruption of CRT resulted in worsening of LV function and desynchronization. Therefore, continuous long-term pacing is warranted to maintain the beneficial effects. (Am J Cardiol 2008;102:718–721)

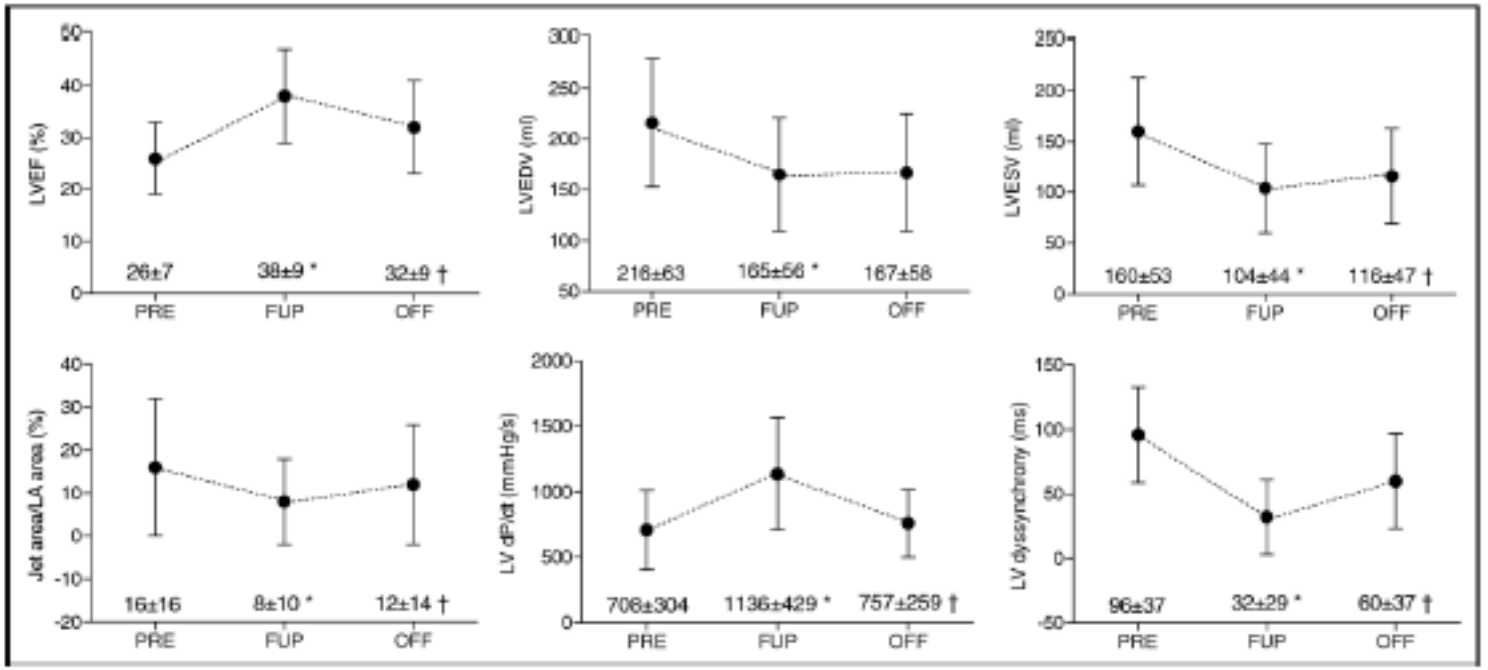


Figure 1. Echocardiographic measurements at baseline (PRE), 6-months follow-up (FUP), and during interruption of CRT (OFF) in 135 CRT responders. *PRE versus FUP, p <0.001; †FUP versus OFF, p <0.001. LVEDV = LV end-diastolic volume; LVESV = LV end-systolic volume.

Table 23 **Class I recommendations for devices in patients with LV systolic dysfunction**

ICD	
Prior resuscitated cardiac arrest	Class I Level A
Ischaemic aetiology and >40 days of MI	Class I Level A
Non-ischaemic aetiology	Class I Level B
CRT	
NYHA Class III/IV and QRS >120 ms	Class I Level A
To improve symptoms/reduce hospitalization	Class I Level A
To reduce mortality	Class I Level A

ESC/EHRA HF Guidelines Eur H J 2008