

# **CRT-D or CRT-P: HOW TO CHOOSE THE RIGHT PATIENT?**

**Alessandro Lipari, MD**



Chair and Department of Cardiology  
University of Study and Spedali Civili  
Brescia -Italy



# The birth of CRT ... in Europe, 20

## Four chamber pacing in dilated cardiomyopathy.

Cazeau S<sup>1</sup>, Ritter P, Bakdach S, Lazarus A, Limousin M, Henao L, Mundler O, Daubert JC, Mugica J

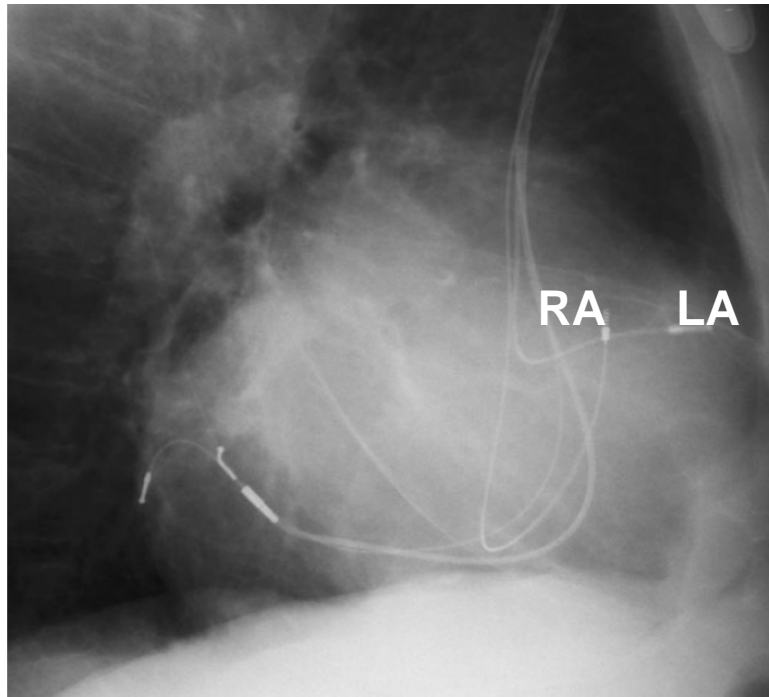


Figure 1 Lateral X-ray view of the first fully transvenous cardiac resynchronization therapy system (courtesy of D.G. and J.-C.D., University Hospital of Rennes, August 1994).

- 54-yrs man
- received a four chamber pacing system
- severe congestive heart failure (NYHA IV)
- left bundle branch block (200-msec QRS duration)
- 200-msec PR interval,
- 90-msec interatrial interval

**acute hemodynamic study :  $\uparrow$ CO - $\downarrow$  PWCP**

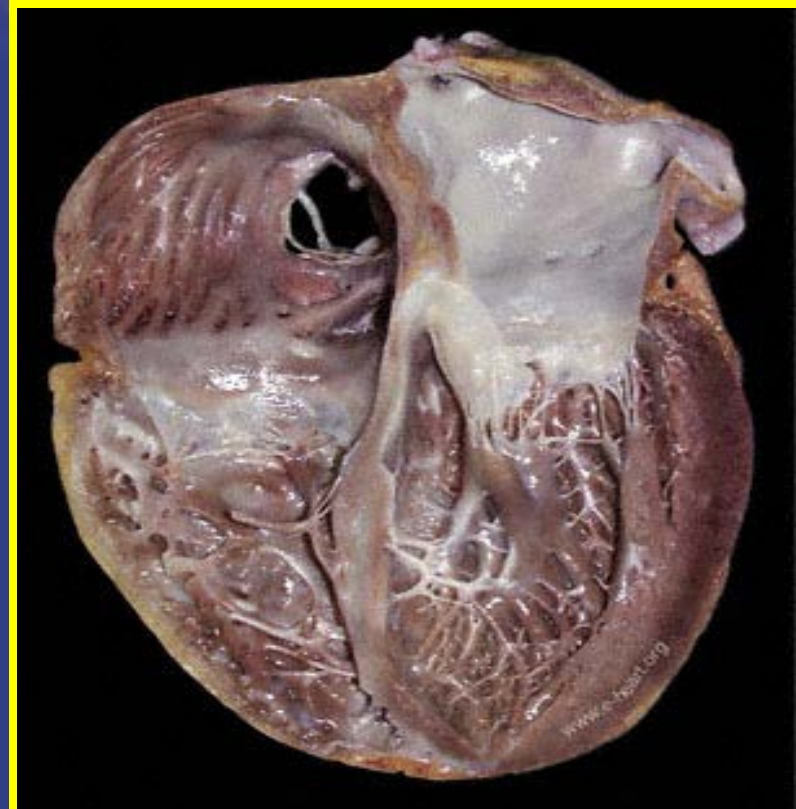
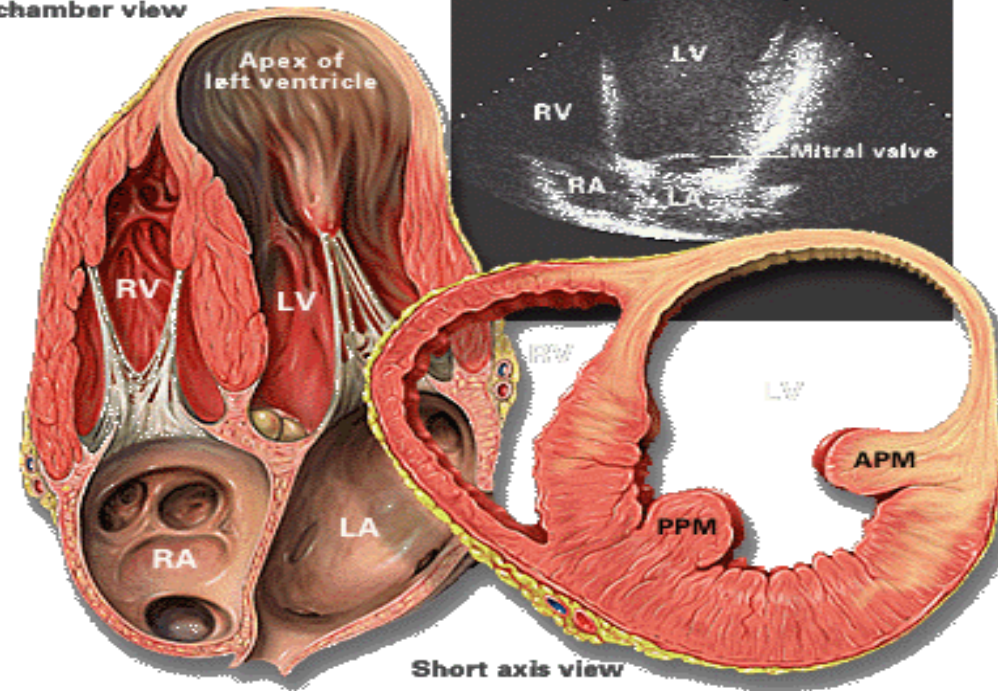
**1994, the first four-chamber cardiac resynchronization therapy implantation**



# Myocardial Infarction

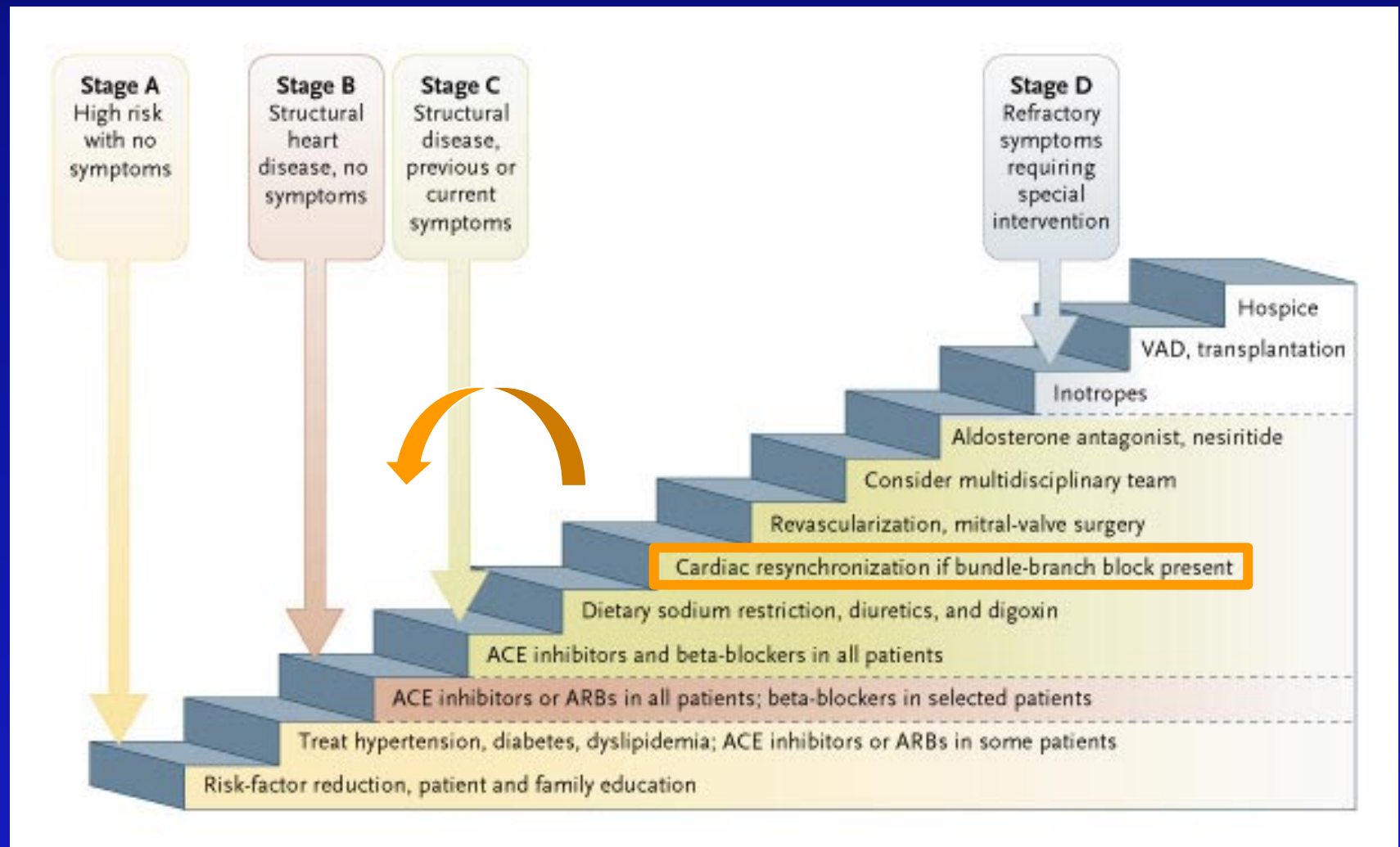
# Dilated Cardiomyopathy

Apical four  
chamber view





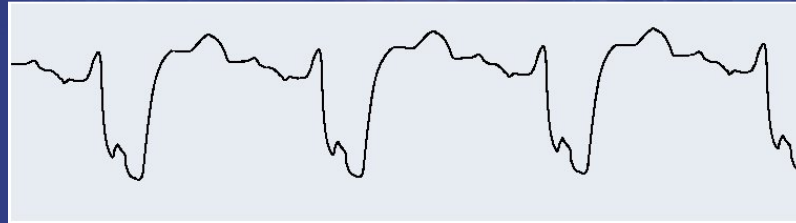
# Stages of Heart Failure and Treatment Options



# Electro-mechanical decoupling: Factors that make up the heart dissynchrony

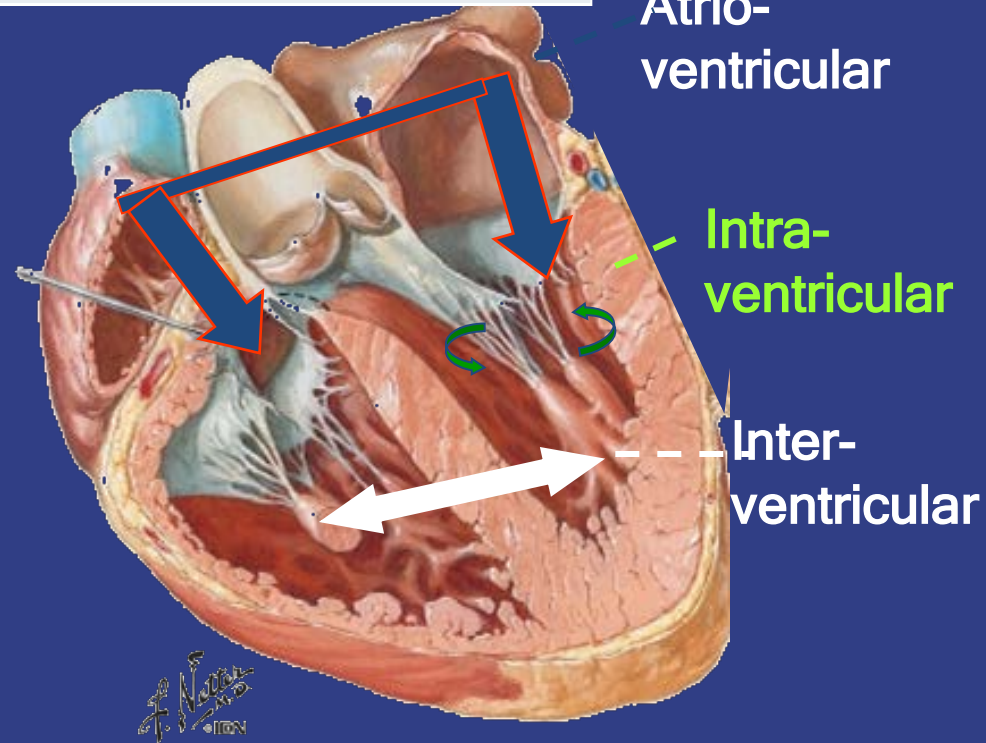
## Electrical

- QRS wide
- LBBB



## Mechanical Dissynchrony

- Atrio-ventricular
- intra- ventricular
- inter-ventricular



# CRT Objective:

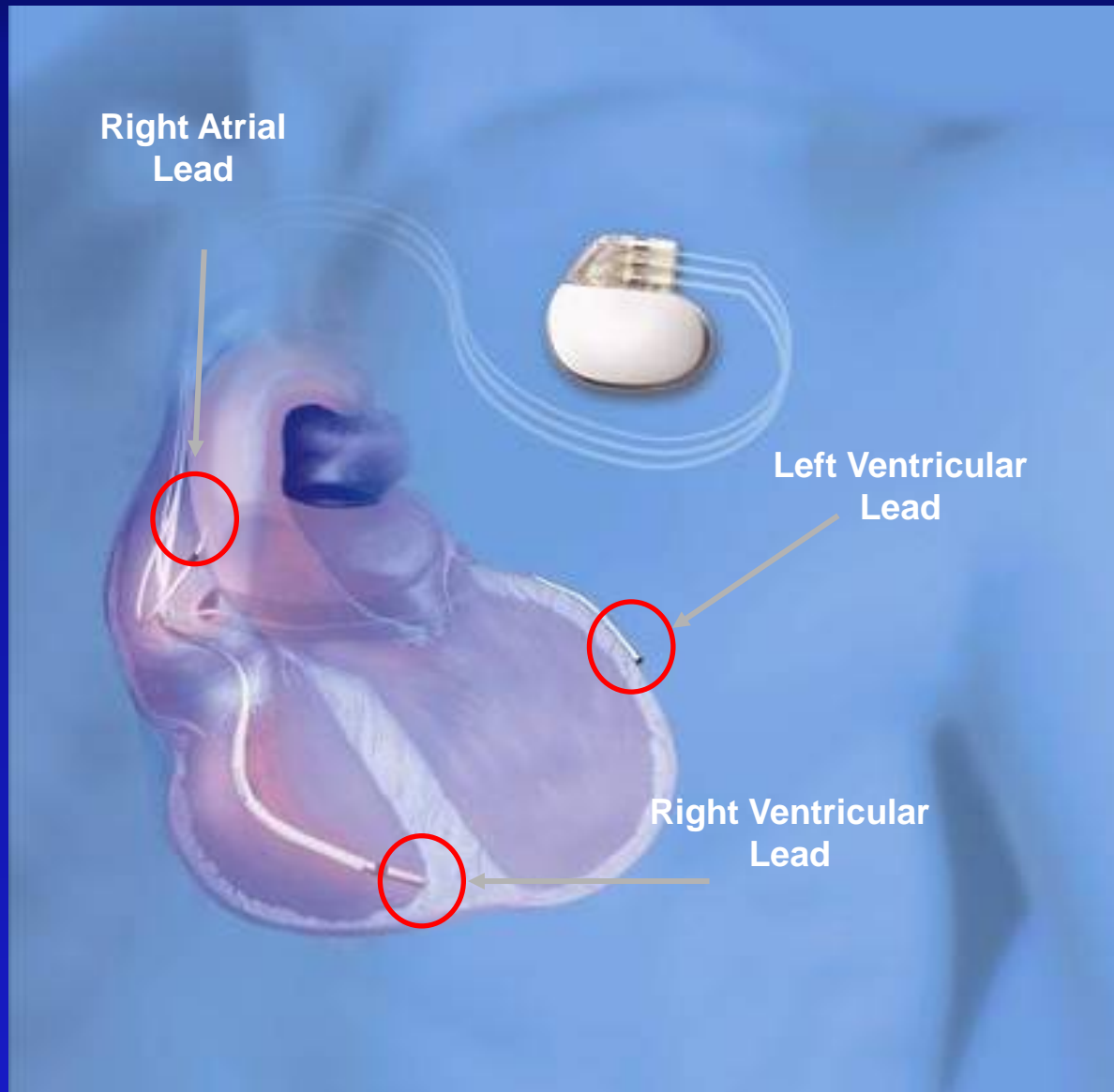
Stimulate both ventricles  
more or less simultaneously

## Methods:

### Transvenous Approach

- Well-established technique  
(thousands of patients already treated)
- Possibility of using the catheter that best suits the patient's anatomy.

# Cardiac Resynchronization



# Failure of coronary sinus lead implantation: alternative approaches

- Epicardial Approach :
  - thoracotomy
  - Minithoracotomy
  - video-assisted thoracoscopic and robotic
- Transapical endocardial
- Transeptal approach (Inter-atrial puncture)

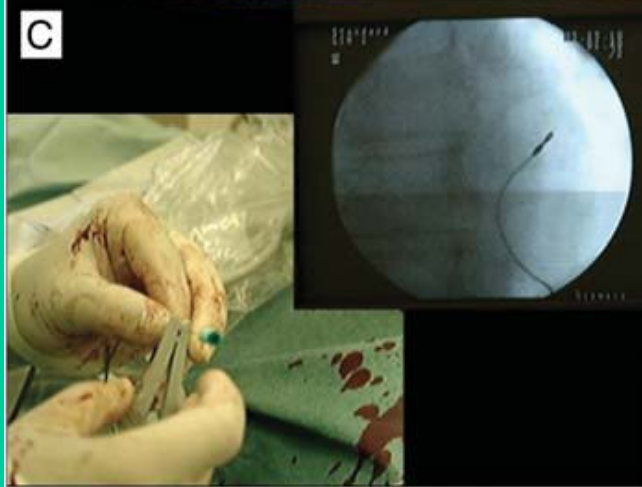


# Transapical endocardial approach

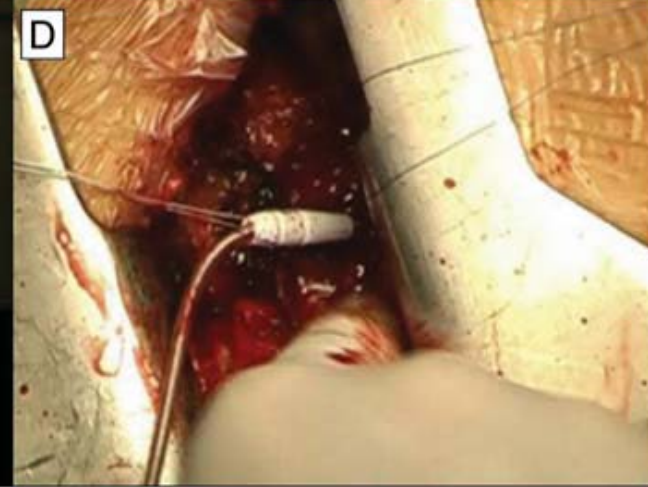
Intraoperative transthoracic echocardiography for apex site localization.



Transthoracic two-stage Seldinger-type puncture and dilatation of the apex



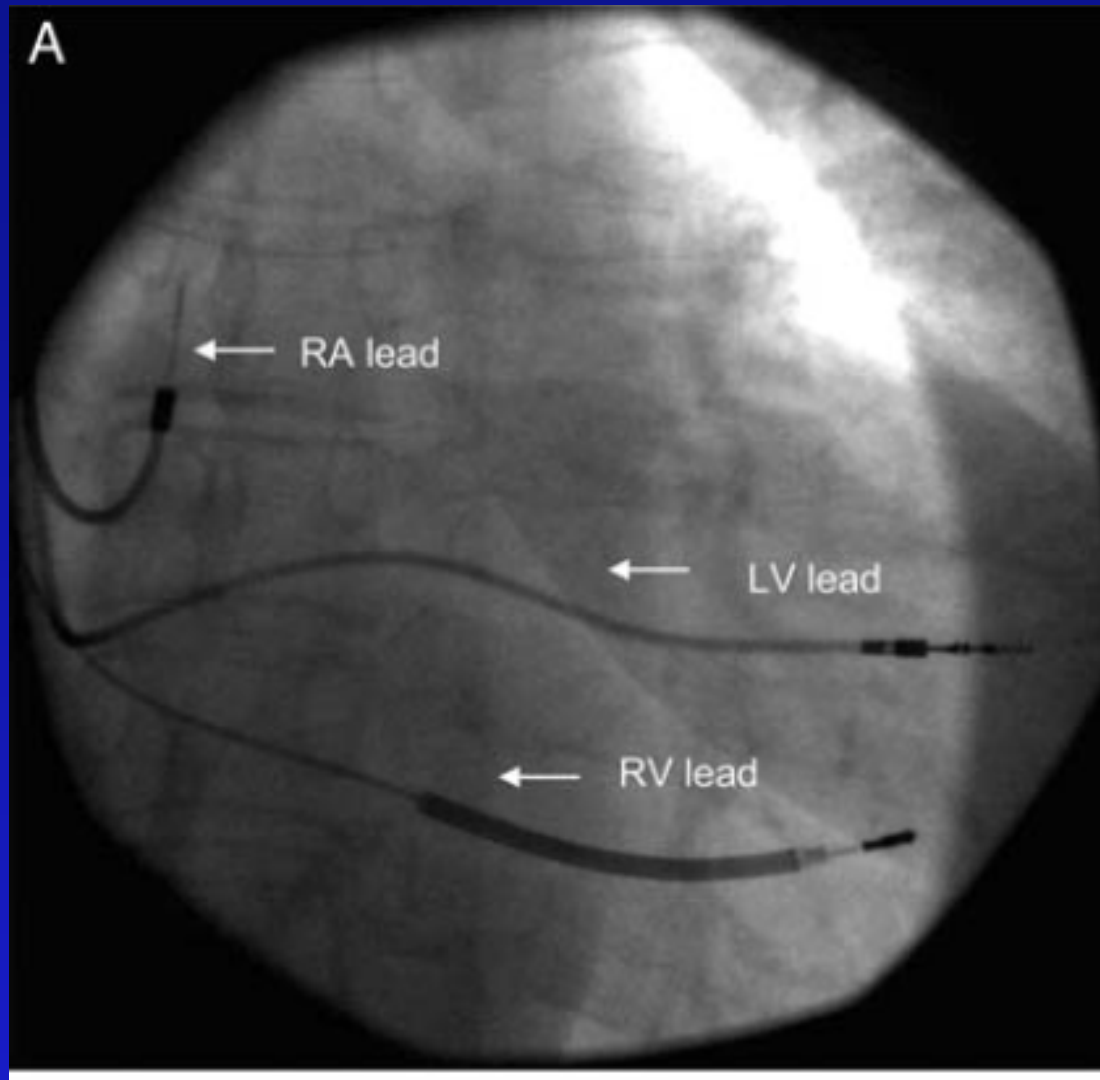
Positioning and fixation of the lead under fluoroscopy guidance



Apex site fixation of the electrode via thoracotomy

# transeptal approach

the LV lead crosses the atrial septum, mitral valve and is actively fixed to the LV endocardial surface.



# Randomized Controlled Trials on CRT

**On Top of Optimal Drug Therapy  
CRT Improves:**

**NYHA Class,  
Quality of life score,  
Exercise Capacity: 6 MW, Peak VO<sub>2</sub>  
LV function: EF, MR  
Reverse remodeling: LVEDV  
Hospitalization**

Study (n  
randomiz

MIRACI

MUSTIC

MUSTIC

PATH CF

MIRACLE

CONTA

COMPAN

PATH CF

MIRACLE

CARE H

Results

+

+

+

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LVEF ≤ 35% for all trials

\* RV paced QRS

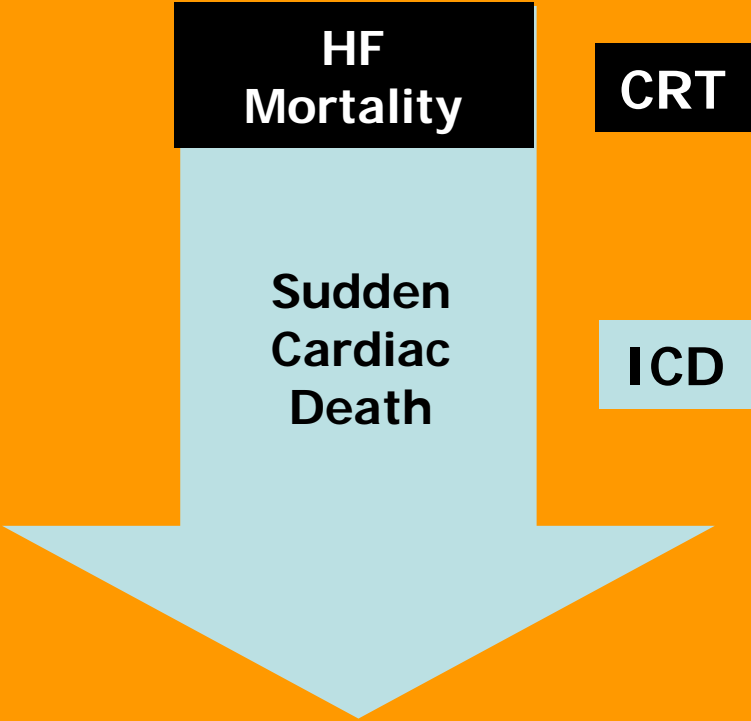
† Primary endpoint not met; key secondary endpoints reached

# Clinical Evidence: CRT Reduces Mortality & Hosp.

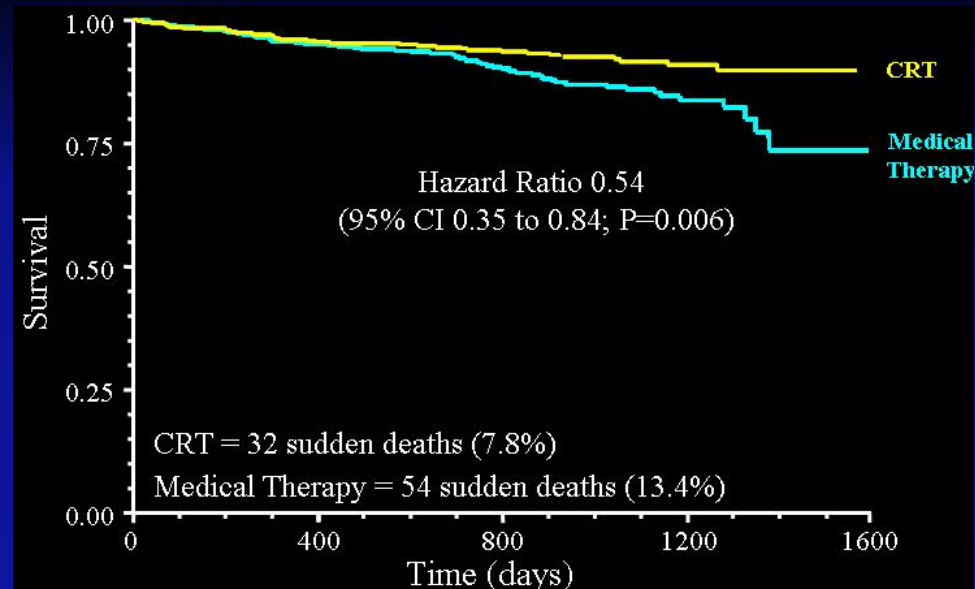
STUDY	TREATMENT	FOLLOW-UP	MORTALITY +	MORTALITY
Single				
CARE				5%
(n=81)				0%
COMP				0 (n.s.)
(n=15)				5%
Meta-				
McAlis				1%
(n=32)				
Freem				3%
(n=33)				
Abdull				3%
(n=25)				
Riverc				9%
(n=23)				

On Top of Optimal Drug Therapy

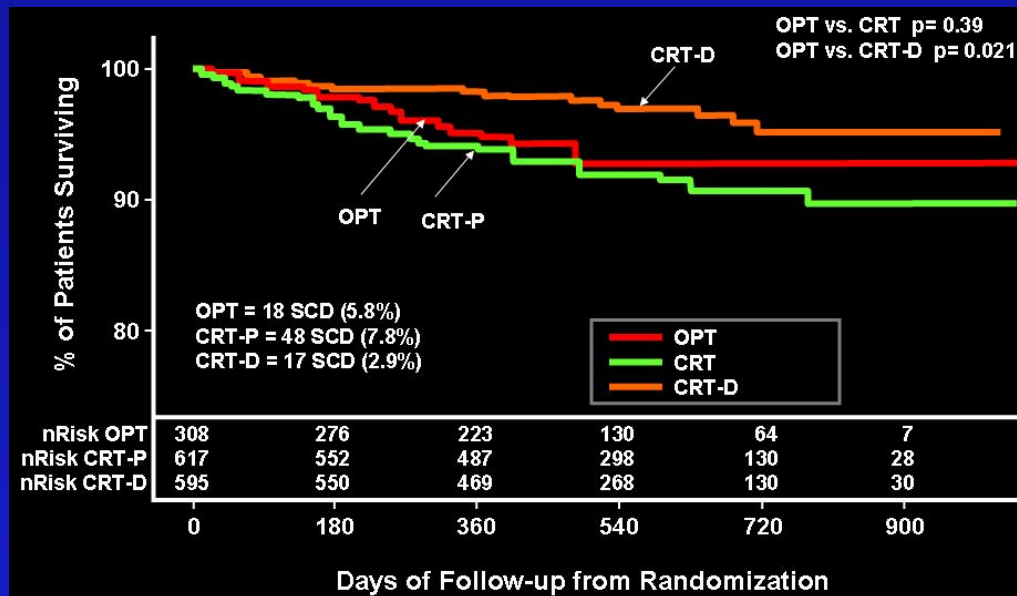
Further Reduction with CRT + ICD  
for Higher Risk Patients



# SCD Mortality



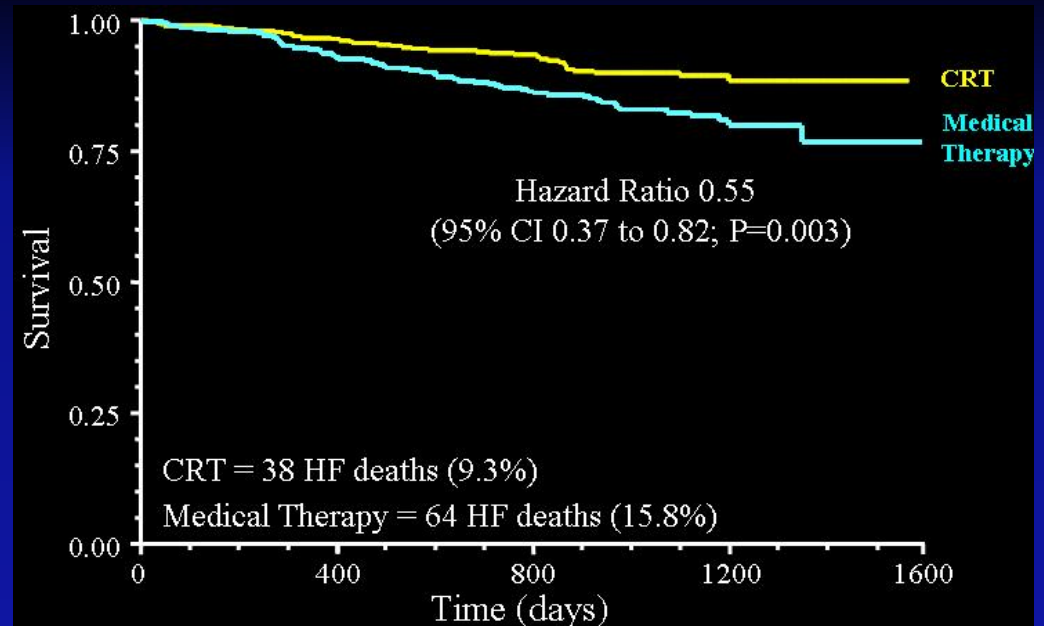
## COMPANION



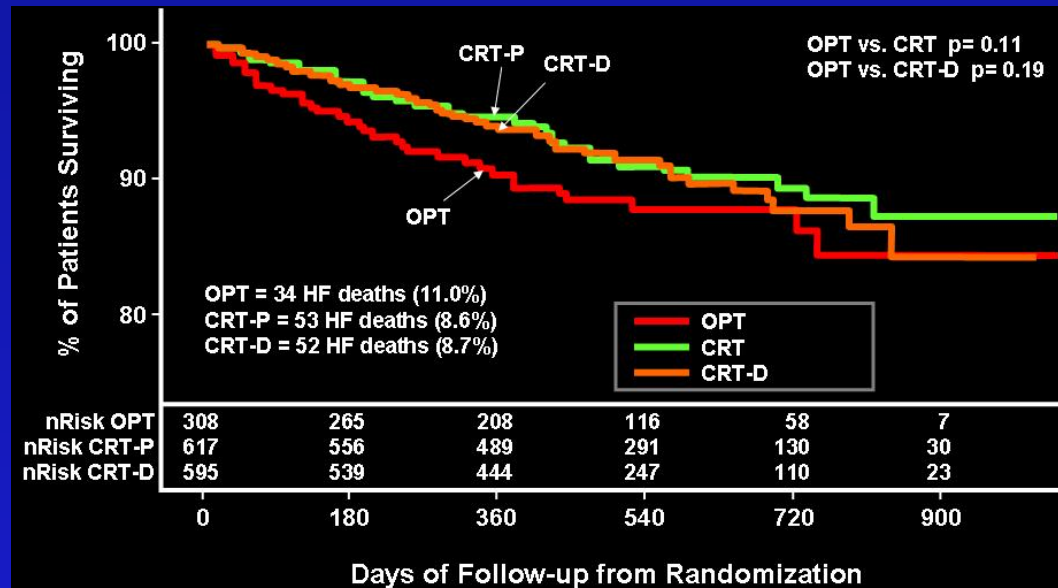
## CARE-HF (extension phase)



# HF Mortality



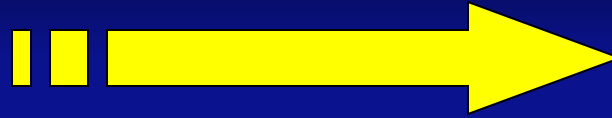
## COMPANION



## CARE-HF (extension phase)

**CRT :**  
**Wait Untill NYHA III ?**

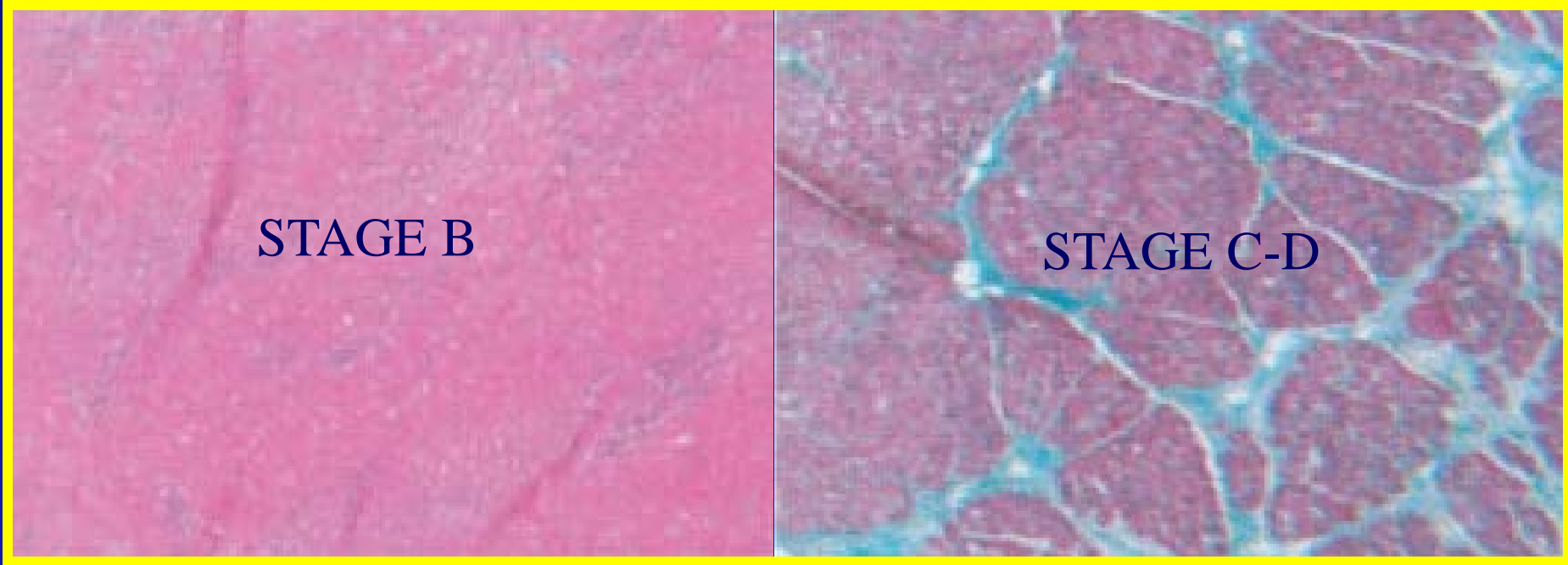
NYHA I-II



NYHA III-IV

STAGE B

STAGE C-D



# Effects of CRT on left ventricular size and function in patients with average IC (NYHA Class II)

The CRT in class II acts by limiting the progression of the disease

## CRT- NYHA CLASS I-II

Trial (ref)	No.	Design	NYHA	LVEF	QRS	Primary endpoints	Secondary endpoints	Main Findings
REVERSE <sup>61</sup>	610	Double-blinded, randomized CRT-ON vs. CRT-OFF, 12 months	I-II	≤40%	≥120	% worsened by clinical composite endpoint	LVESV index, heart failure hospitalizations and all-cause mortality	CRT-P/CRT-D did not change the primary endpoint and did not reduce all-cause mortality <u>but reduced LVESV index and heart failure hospitalizations.</u>
MADIT-CRT <sup>50</sup>	1820	Single-blinded, randomized CRT-D vs. ICD, 12 months	I-II	≤30%	≥130	All-cause mortality or heart failure hospitalizations	All-cause mortality and LVESV	CRT-D reduced the endpoint <u>heart failure hospitalizations or all-cause mortality and LVESV.</u> CRT-D did not reduced all-cause mortality
RAFT <sup>62</sup>	1798	Double-blinded, randomized CRT-D vs. ICD 40 months	II-III	≤30%	≥120	All-cause mortality or heart failure hospitalizations	All-cause mortality and cardiovascular death	CRT-D reduced the endpoint <u>all-cause mortality or heart failure hospitalizations.</u> In NYHA III, CRT-D only reduced significantly all-cause mortality

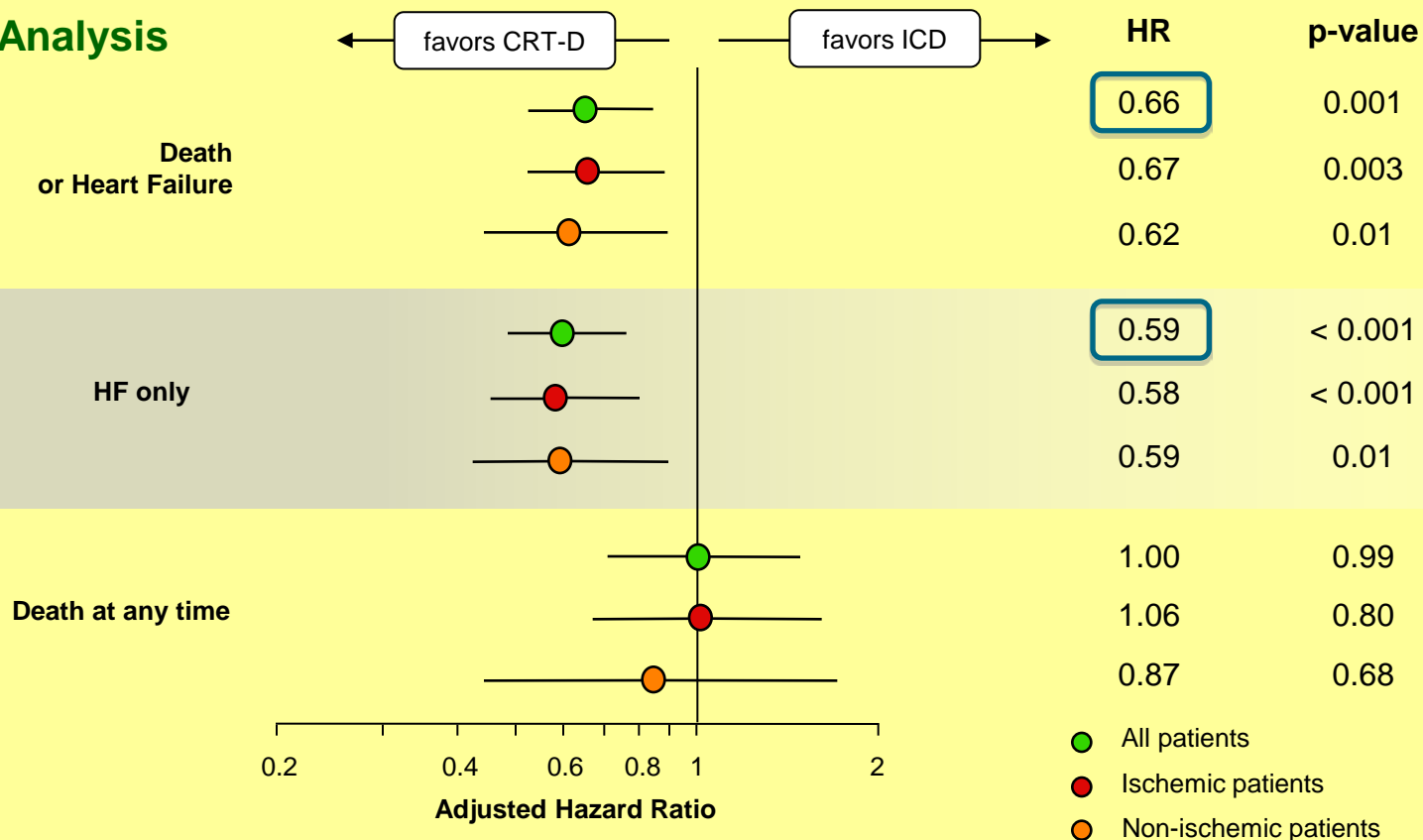


# MADIT-CRT – Results Primary Endpoint

**34% reduction in the risk of all-cause mortality or first HF event**

- Benefit driven by **41% reduction** in the risk of heart failure events
- **Similar benefit** for ischemic and non-ischemic patient

## Cox Analysis



# Clinical guidance to the choice of CRT-P or CRT-D in primary prevention

Factors favouring CRT-P	Factors favouring CRT-D
Advanced heart failure	Life expectancy >1 year
Severe renal insufficiency or dialysis	Stable heart failure, NYHA II
Other major co-morbidities	Ischaemic heart disease (low and intermediate MADIT risk score)
Frailty	Lack of comorbidities
Cachexia	

### Factors favouring CRT-P

Advanced heart failure

Severe renal insufficiency  
or dialysis

Other major co-morbidities

Frailty

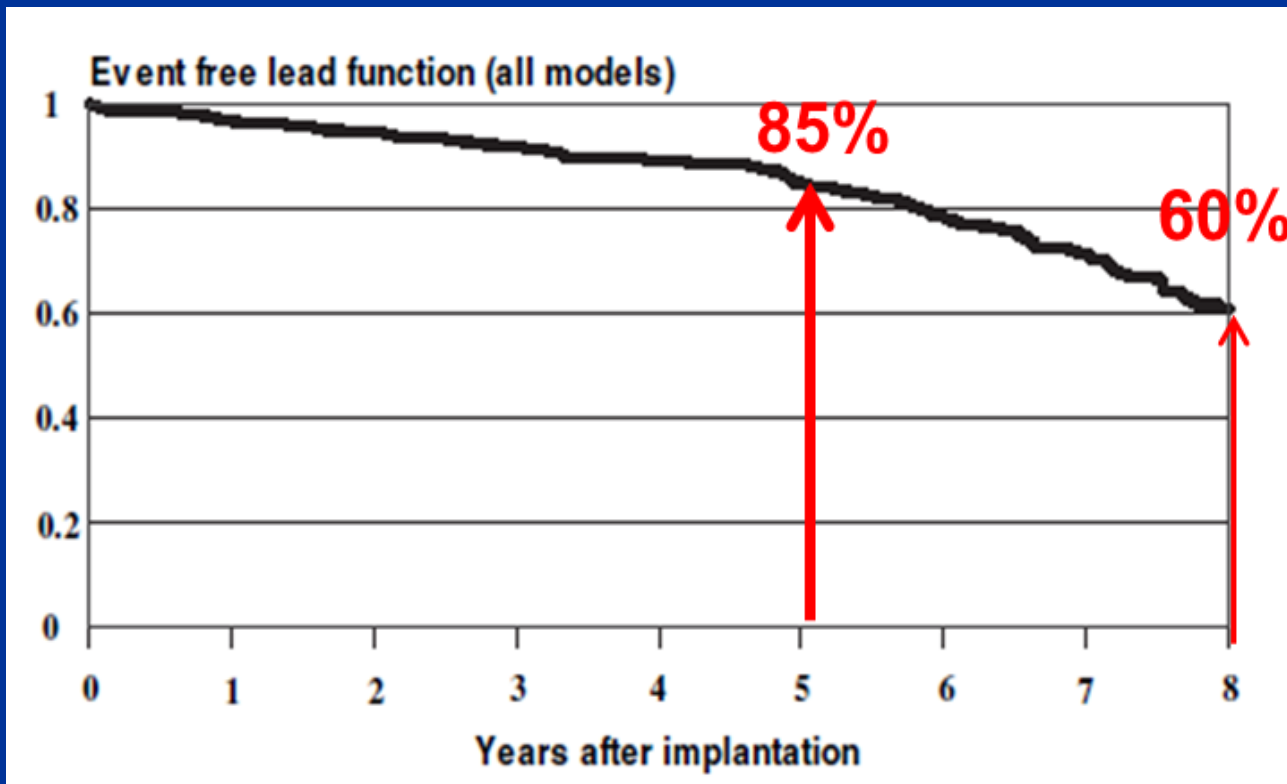
Cachexia

improve quality of life

No ICD-related problems

# ICD-related problems

## Defibrillation lead malfunctioning

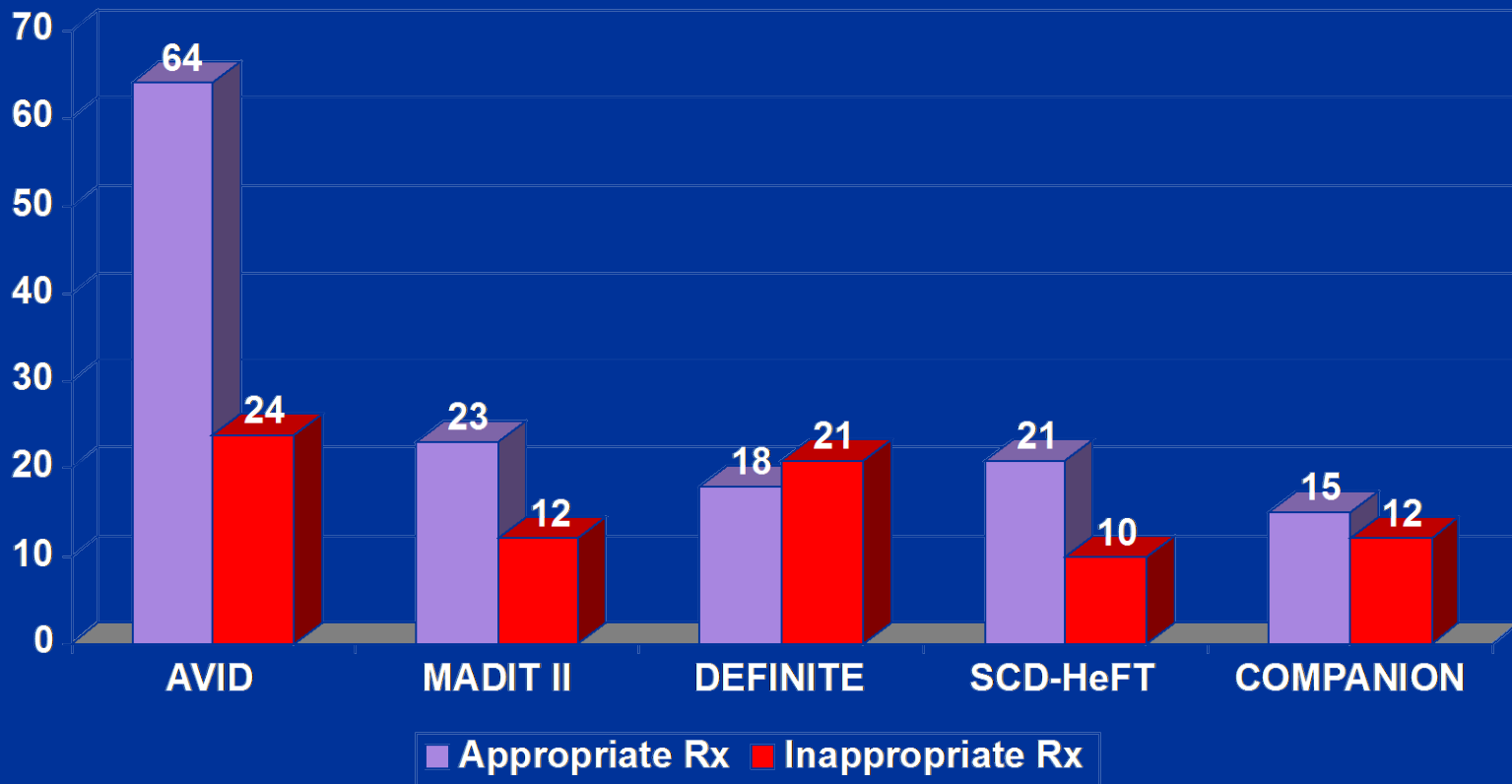


PM 28% at 10 years

ICD 40% at 8 years

## Inappropriate Shocks

# Rates of ICD Therapies in Major Clinical Trial

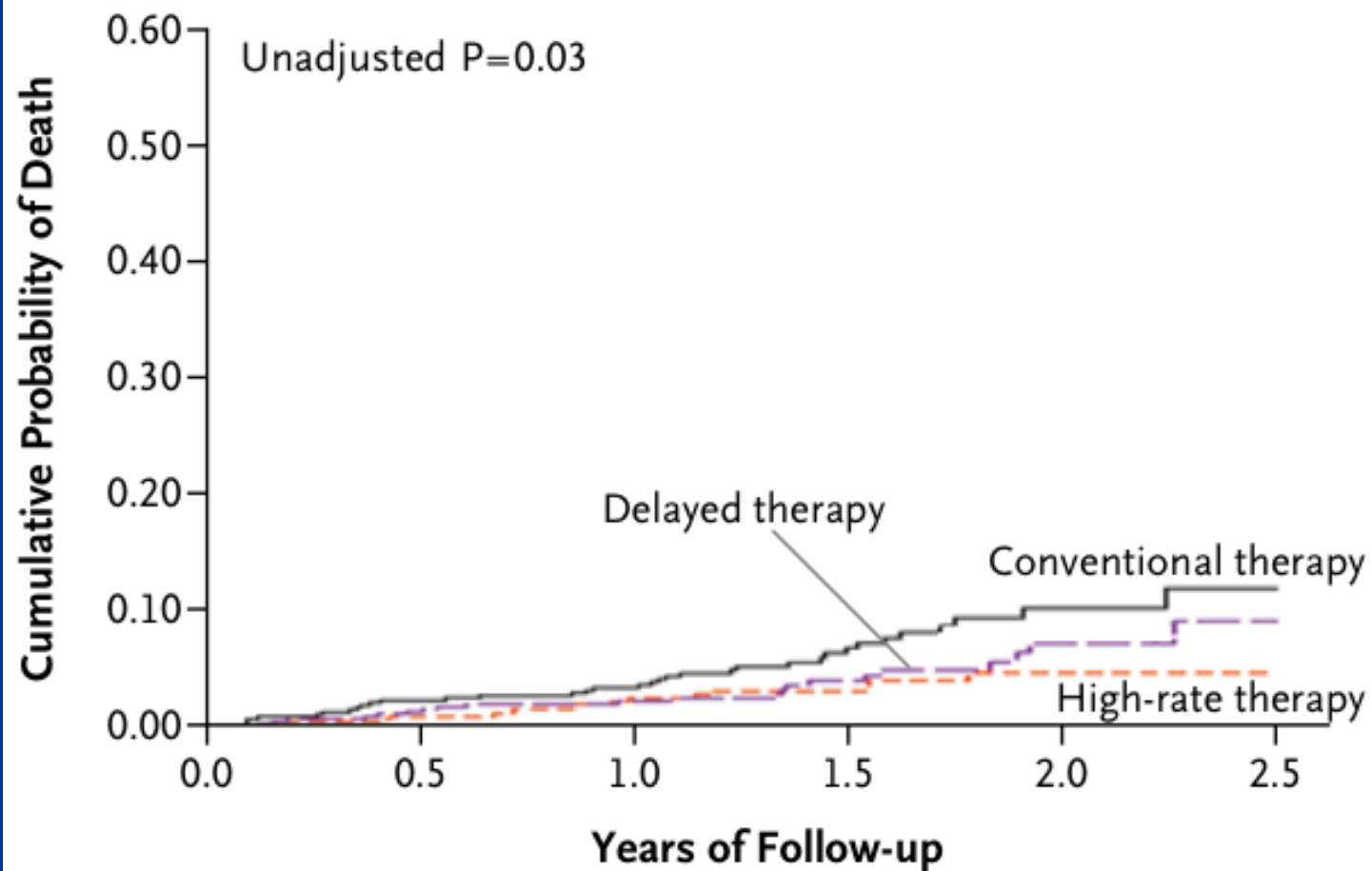




# Effect of Inappropriate Shock Therapy in ICD Recipients

- Worsening of QoL
- Increasing Health Care resource utilization
- Linking with adverse outcome

# MADIT-RIT



# CRT and AV Node Ablation

## CRT EFFECT



INTERventricular resync.

INTRAventricular resync.



100% "PURE" CRT STIMULATION

## NAV-ABL EFFECT



Rythm reg.  
FC complete control

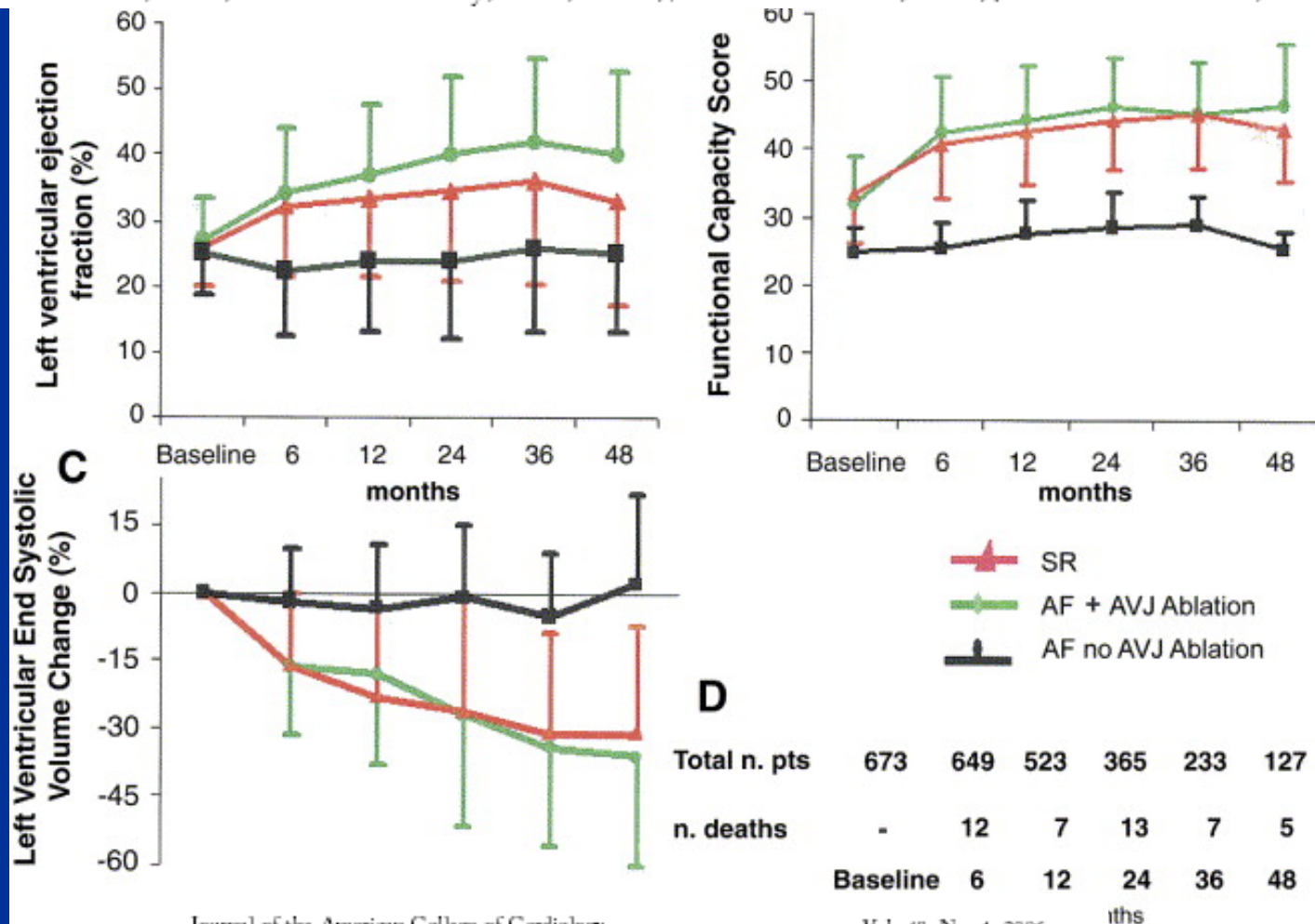


~~AV~~  
resynchronization

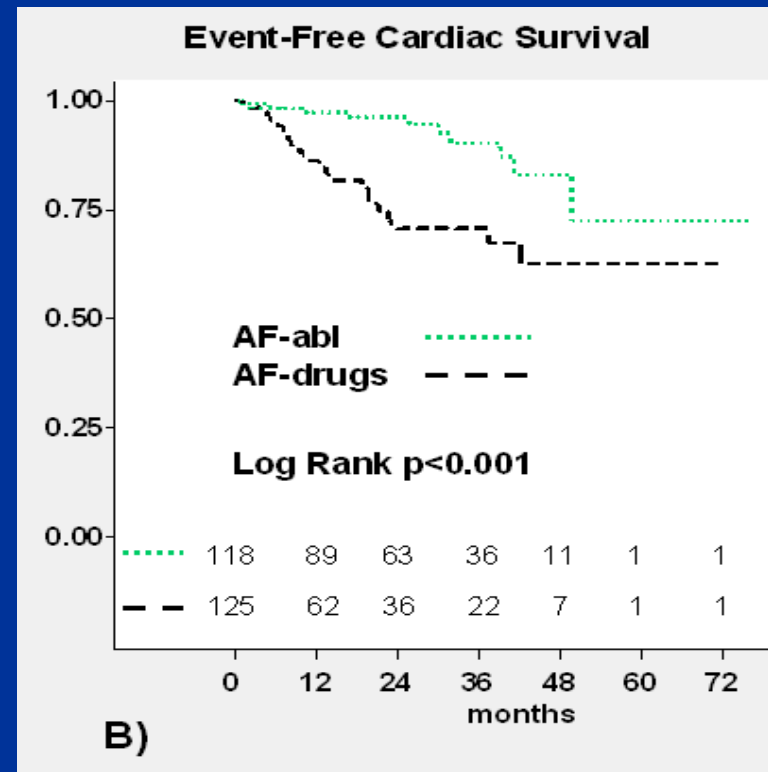
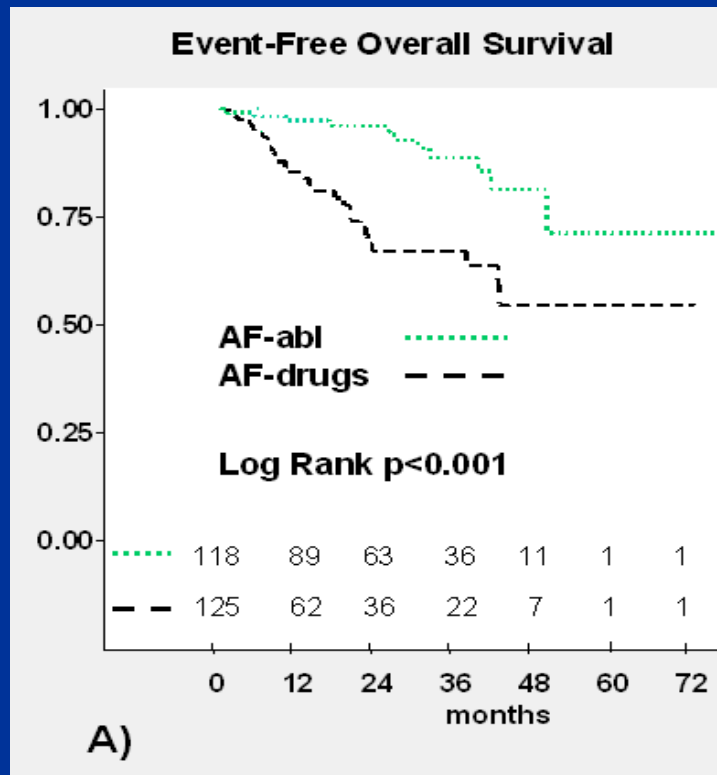
# Four-Year Efficacy of Cardiac Resynchronization Therapy on Exercise Tolerance and Disease Progression

## The Importance of Performing Atrioventricular Junction Ablation in Patients With Atrial Fibrillation

Maurizio Gasparini, MD,\* Angelo Auricchio, MD, PhD,†§ François Regoli, MD,\* Cecilia Fantoni, MD,‡ Mihoko Kawabata, MD,‡ Paola Galimberti, MD,\* Daniela Pini, MD,\* Carlo Ceriotti, MD,\* Edoardo Gronda, MD,\* Catherine Klersy, MD, MSc,† Simona Fratini, MD,‡ Helmut H. Klein, MD‡



# ABLATE AND CRT PACE EFFECT ON LONG TERM SURVIVAL IN PT WITH HF



# CONCLUSION

- Benefits of CRT in terms of life expectancy, improvement of QoL, NYHA Class and reduction of re-hospitalizations and mortality, makes this therapy the strategy of choice in a selected group of patients
- Evidence suggests that in patients with poor life expectancy and severe comorbidities, the addition of ICD to CRT does not improve life expectancy and survival in comparison with CRT-P that can improve the QoL