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When and why to provide cardiac resynchronization therapy

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Potential conflicts of interest

Speaker's name : Patrizio, Lancellotti, Liège, Belgium

☑ I have no conflicts of interest to report

Case Summary

Man : 53 y old

ICM, EF 35%, Severe MR

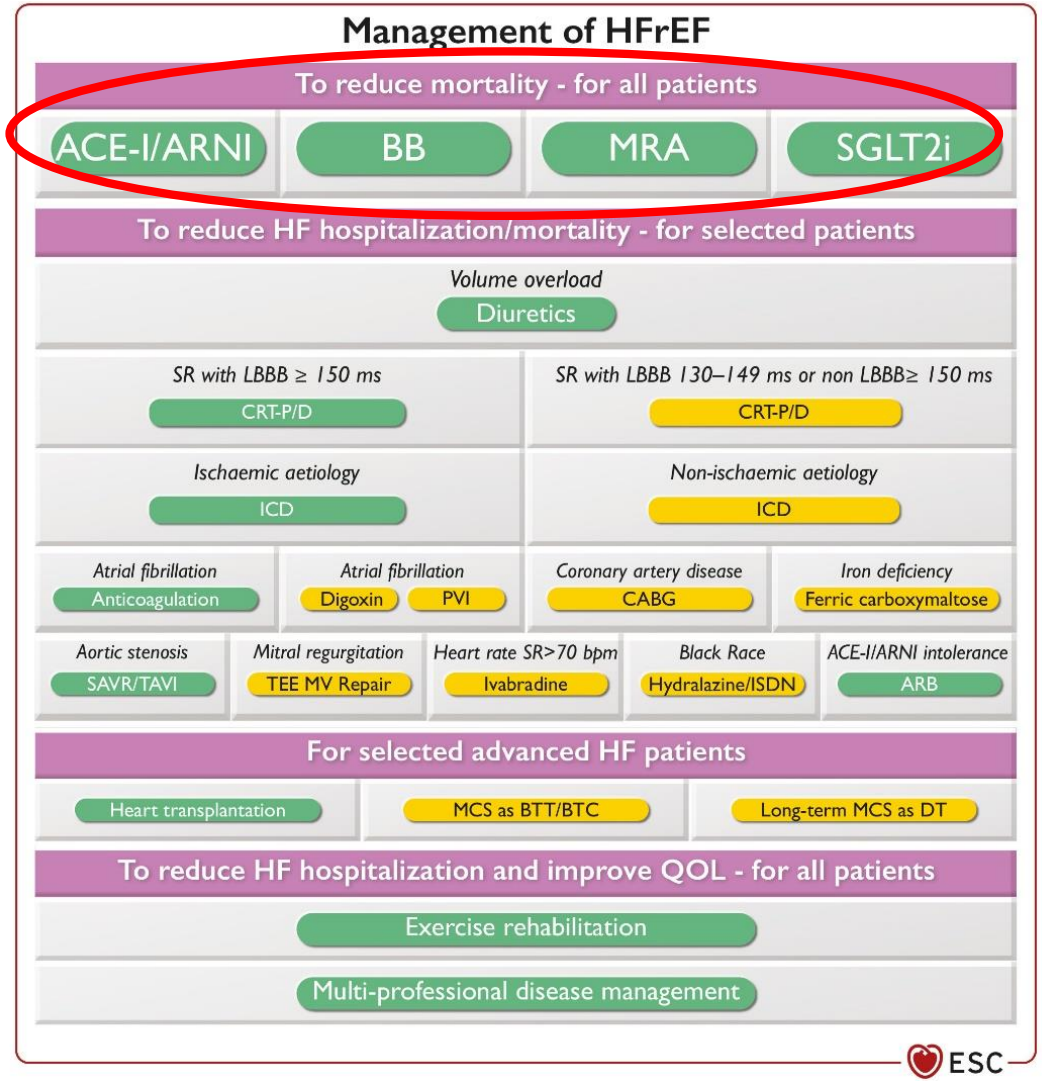
EuroScore II: 8.55%

NYHA Class III

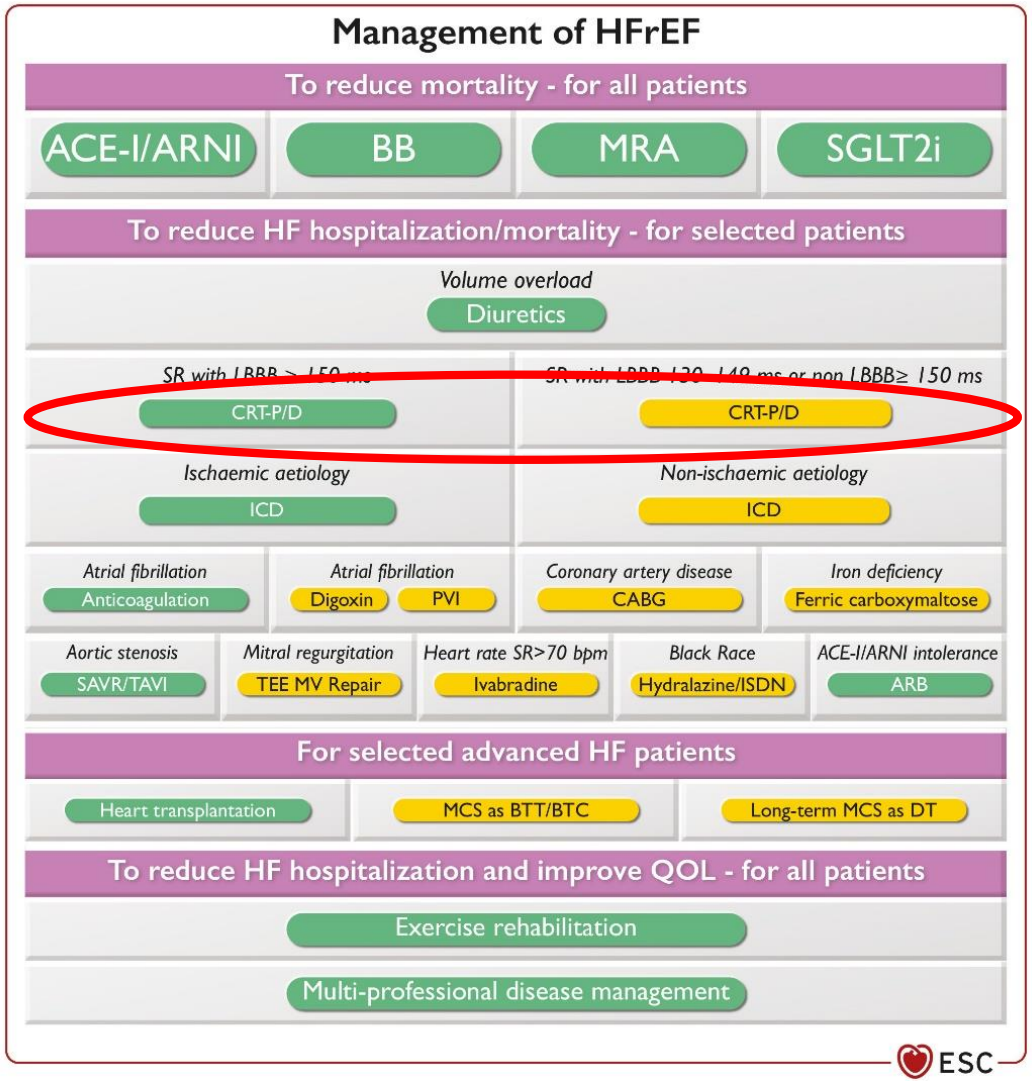
Maximum Tailored Medical Therapy

ECG: LBBB with QRS 125 ms, HR > 70/min

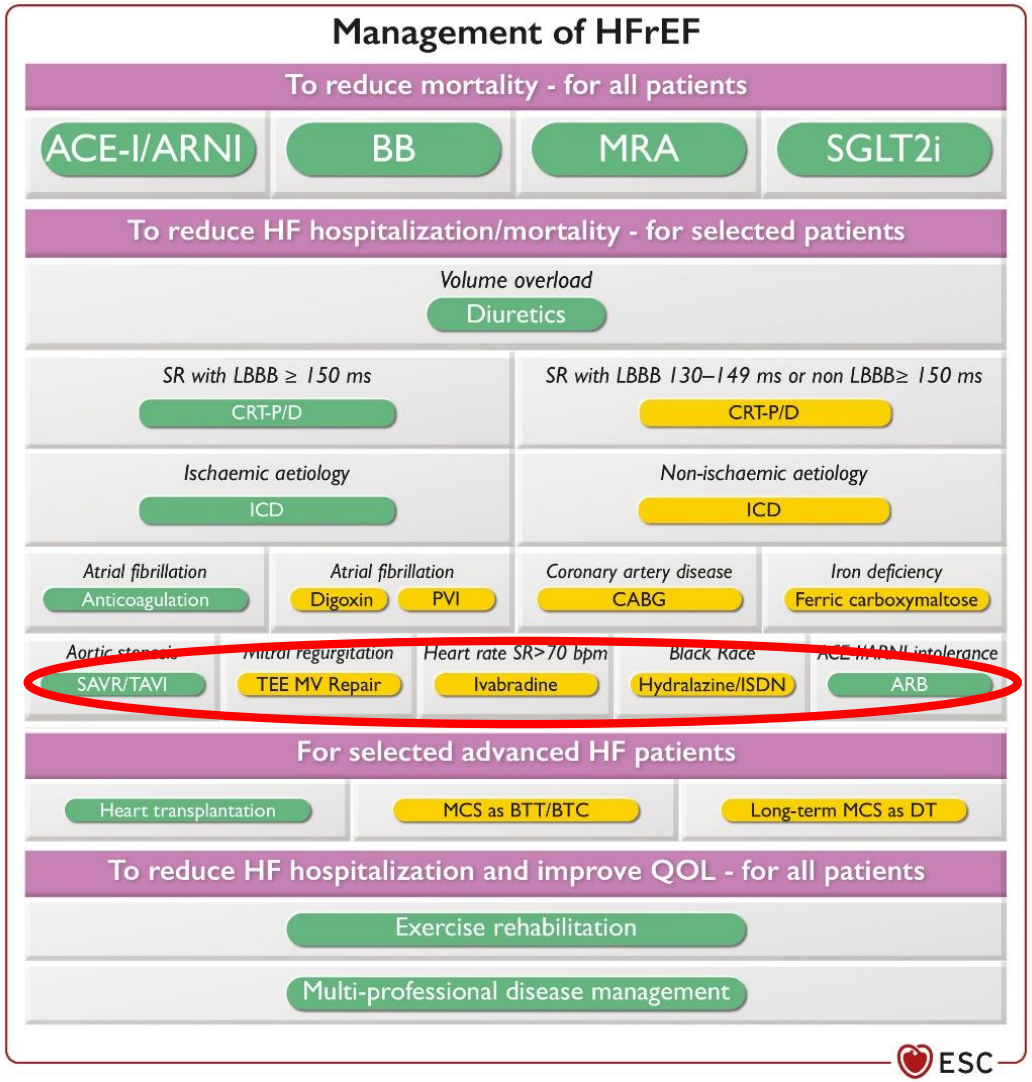
Heart Failure Management



Heart Failure Management



Heart Failure Management



Mitral Regurgitation Management

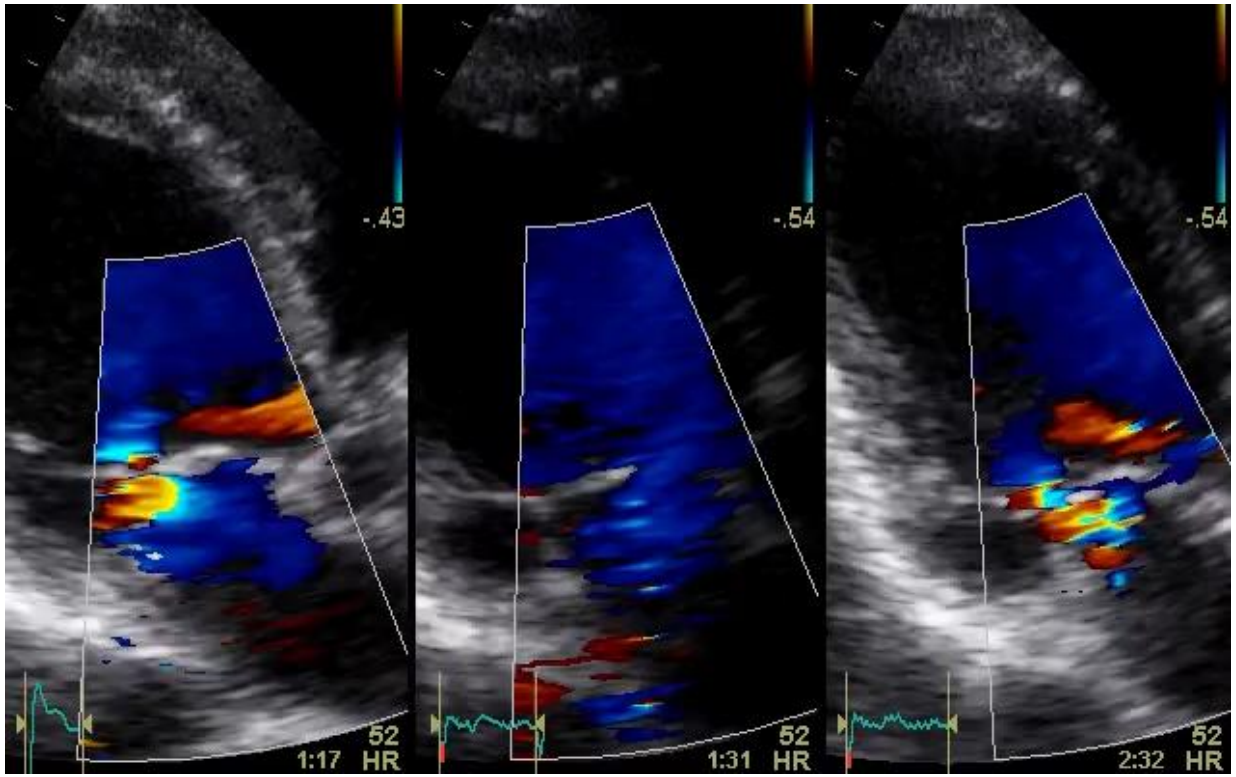
CRT is part of medical treatment

Recommendations	Class	Level
Valve surgery/intervention is recommended only in patients with severe SMR who remain symptomatic despite GDMT (including CRT if indicated) and has to be decided by a structured collaborative Heart Team.	I	B
Patients with concomitant coronary artery or other cardiac disease requiring treatment		
Valve surgery is recommended in patients undergoing CABG or other cardiac surgery.	I	B
In symptomatic patients, who are judged not appropriate for surgery by the Heart Team on the basis of their individual characteristics, PCI (and/or TAVI) possibly followed by TEER (in case of persisting severe SMR) should be considered.	IIa	C

Management

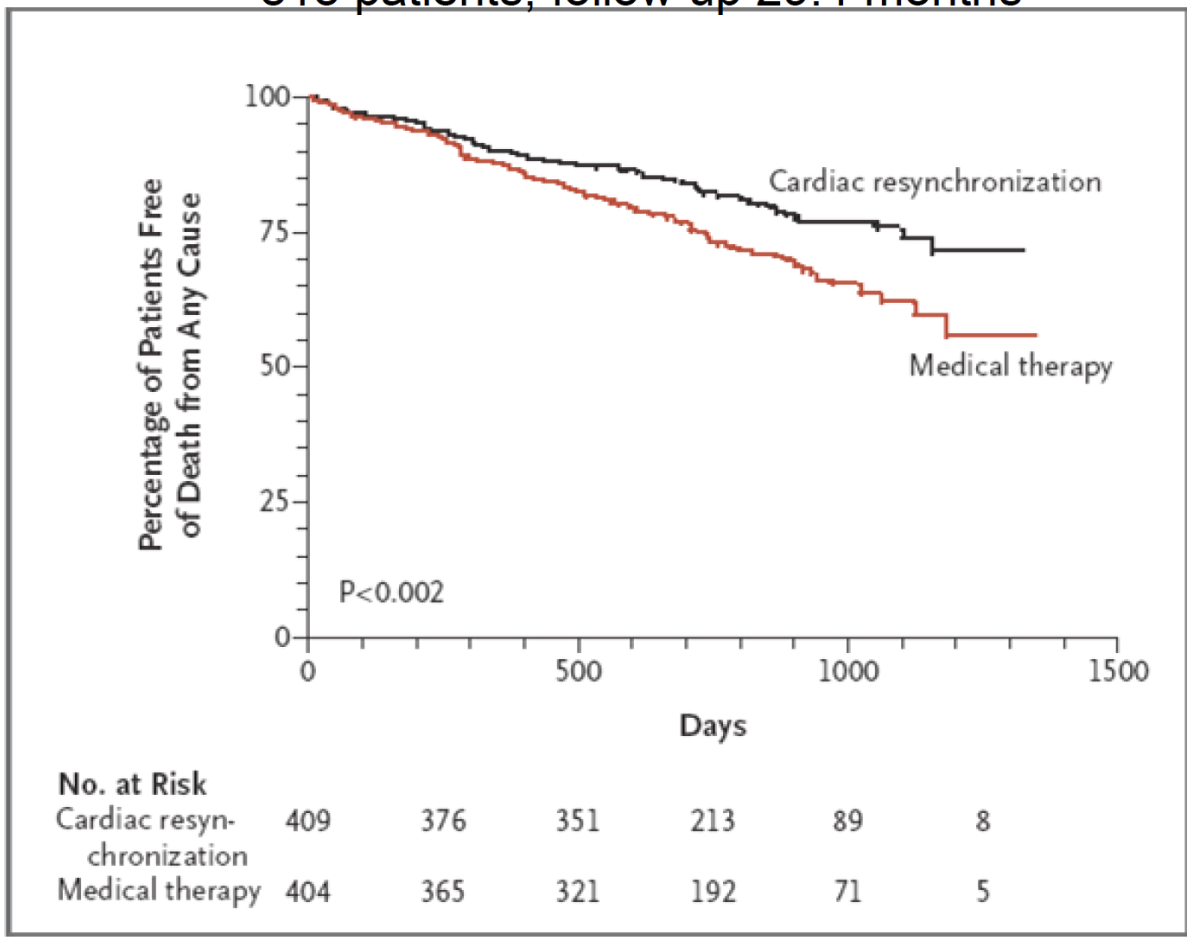
- Angio: no significant stenosis

--> CRT implantation (AV and VV optimisation)



Why CRT in Heart Failure?

813 patients, follow up 29.4 months



CARE-HF: All cause mortality

Inclusion:
NYHA class III or IV
LVEF ≤ 35%
QRS ≥120

CRT therapy resulted in 36% reduction in total mortality (80 vs.120)

Cleland JGF: N Engl J Med 2005;352:1539-49

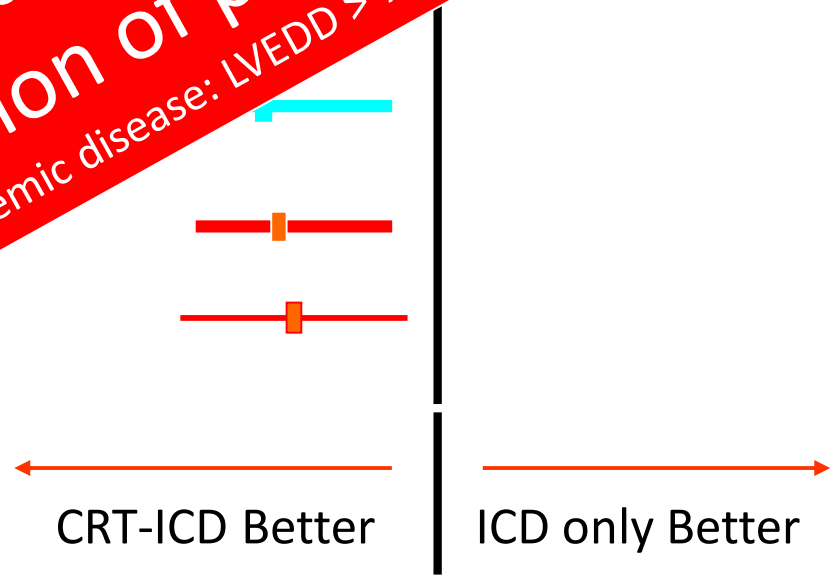
EVALUATION OF LV FUNCTION AND DIAMETER (REMODELIN

LV EF ≤ 25%
LV EF > 25%

LV EDV ≤ 240
LV EDV

Important for the indication and follow-up but not for identification of potential responders

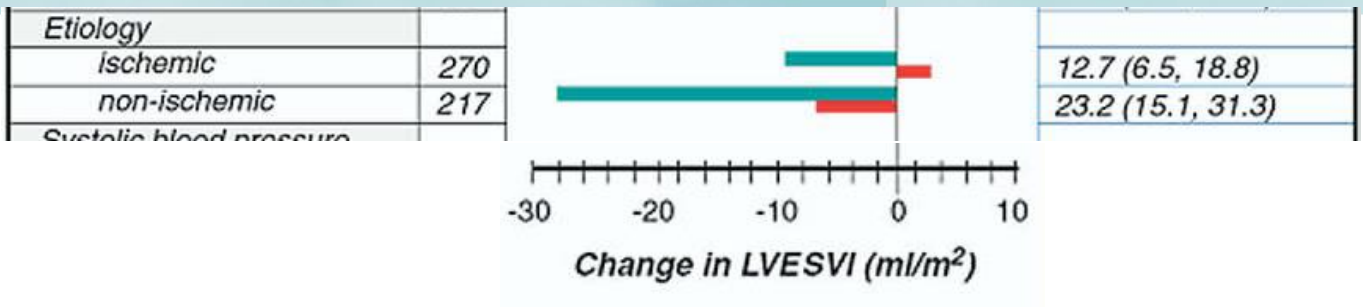
(Except in ischemic disease: LVEDD > 75 mm)

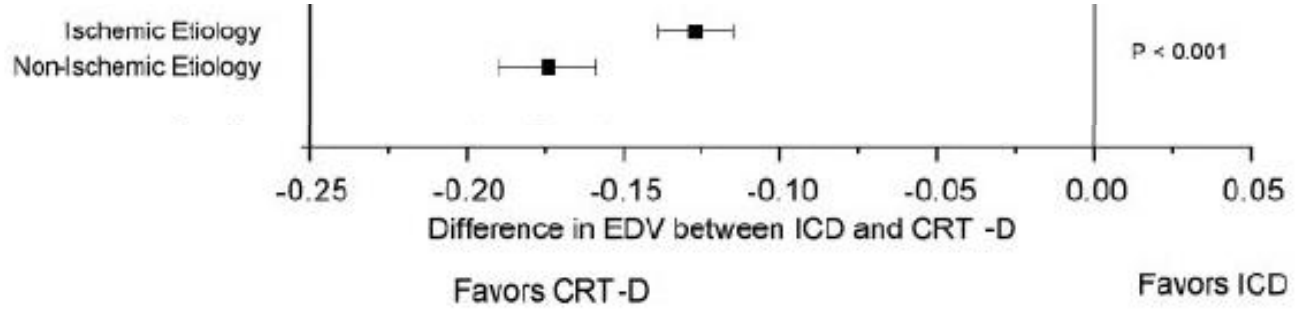


Sim lts for CARE-HF, REVERSE STUDIES

Moss et al NEJM 2009

ETIOLOGY OF THE CARDIOMYOPATHY





MADIT CRT Circ 2010

QUANTIFICATION OF MR

European Journal of Echocardiography
doi:10.1093/ejechocard/jeq031

European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 2: mitral and tricuspid regurgitation (native valve disease)

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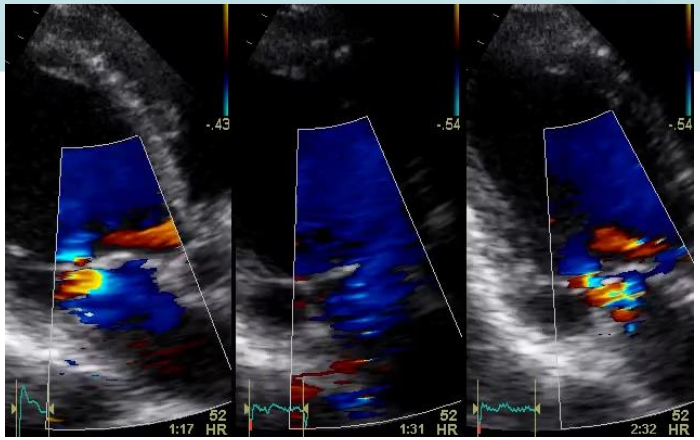


NYHA Class III or IV

NYHA Class I or II

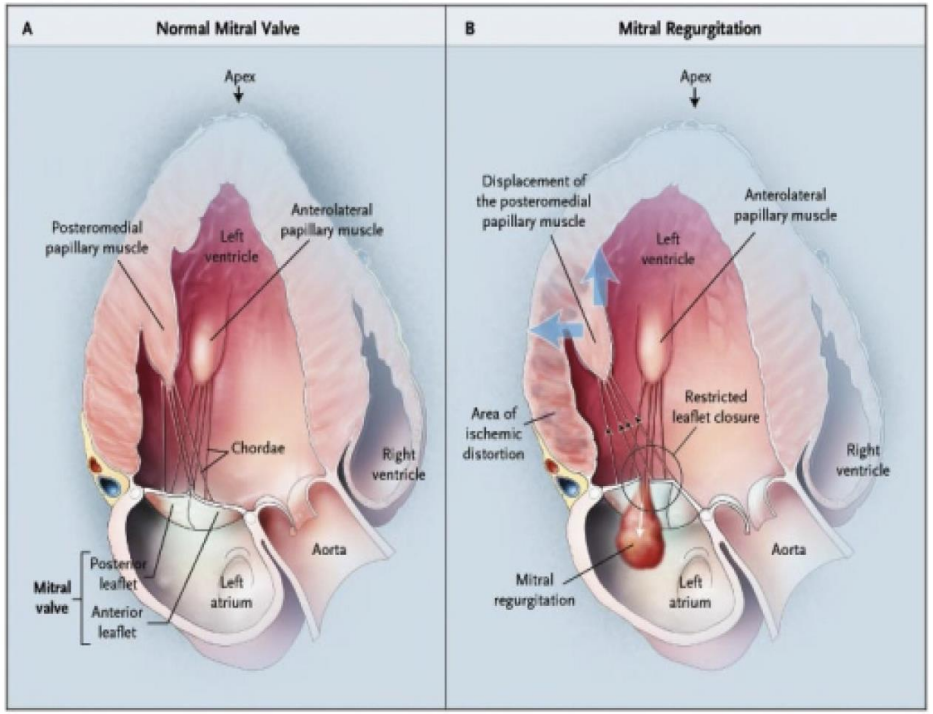
Table 3. Mitral Regurgitation Measures in Patients Who Underwent 12-Month Echocardiograms

	ICD Only (n=108)		CRT-D (n=249)	
	Baseline	12-mo Follow-Up	Baseline	12-mo Follow-Up
MR degree				
None	1.9	0.9	2.4	3.2
Mild	83.3	86.1	82.3	92.8
Moderate	13.0	12.0	13.2	3.6
Severe	1.9	0.9	2.0	0.4

Solomon et al Circulation 2010

Secondary MR (IIIb) in HF

MR Mechanims



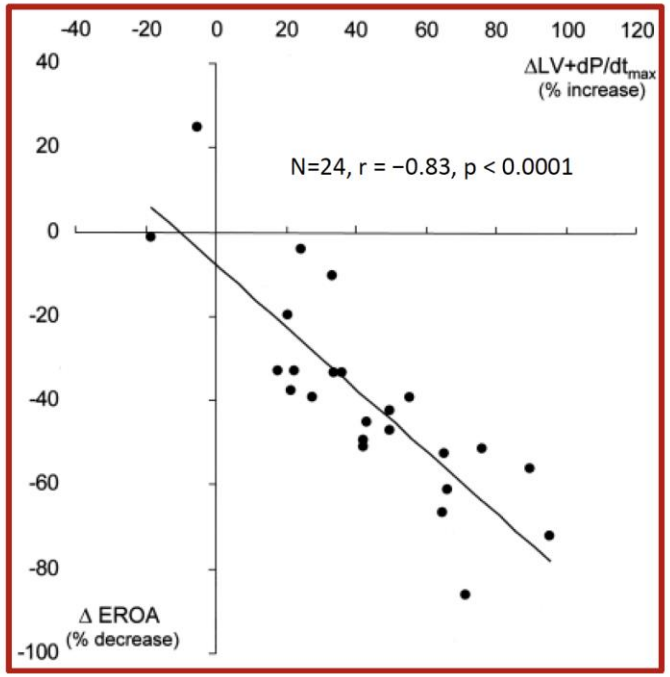
- Leaflet Tethering
  - ❑ Valvular (restriction) and subvalvular (chordal tethering) changes
  - ❑ LV dilatation and ↑sphericity
  - ❑ Annular dilatation
  - ❑ Papillary muscle discoordination
- Closing Forces
  - ❑ LV systolic performance (contractility and dyssynchrony)
  - ❑ Annular contraction/shape
  - ❑ Dynamic changes with exercise

Lancellotti et al, Heart 2008

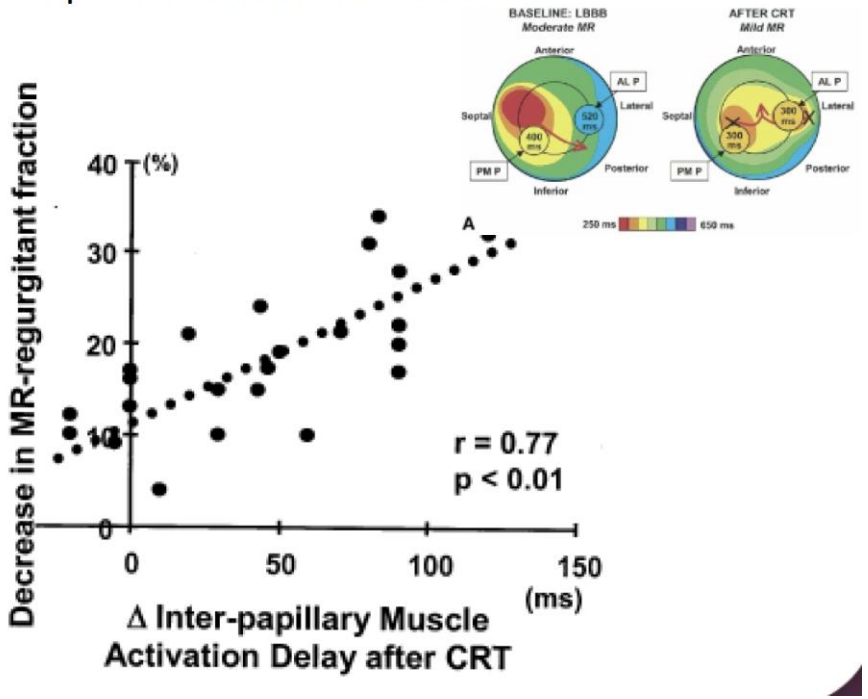
Why CRT for MR?

CRT Causes MR Reduction

CRT Improves Mitral Valve Closing Force



Decrease in InterPapillary Muscle Dyssynchrony Correlates with Improvement in MR Post CRT

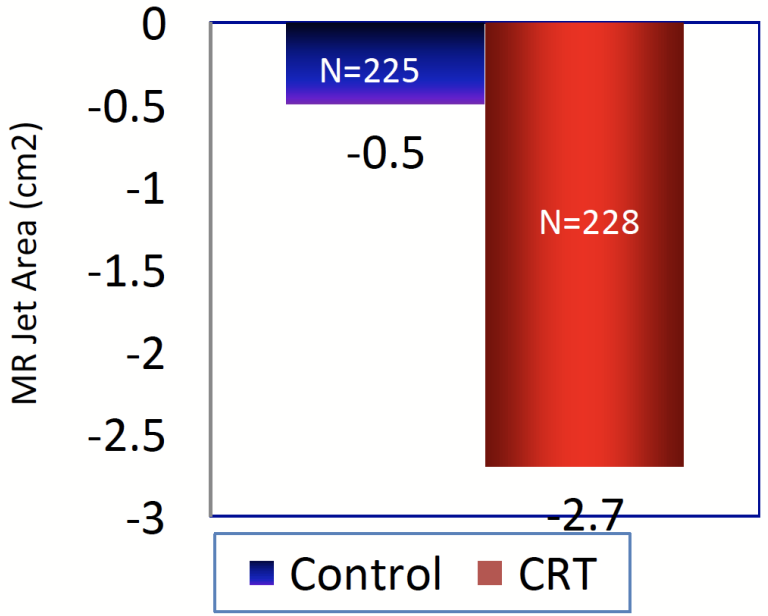


MR → 30 % reduction acutely

Why CRT for MR?

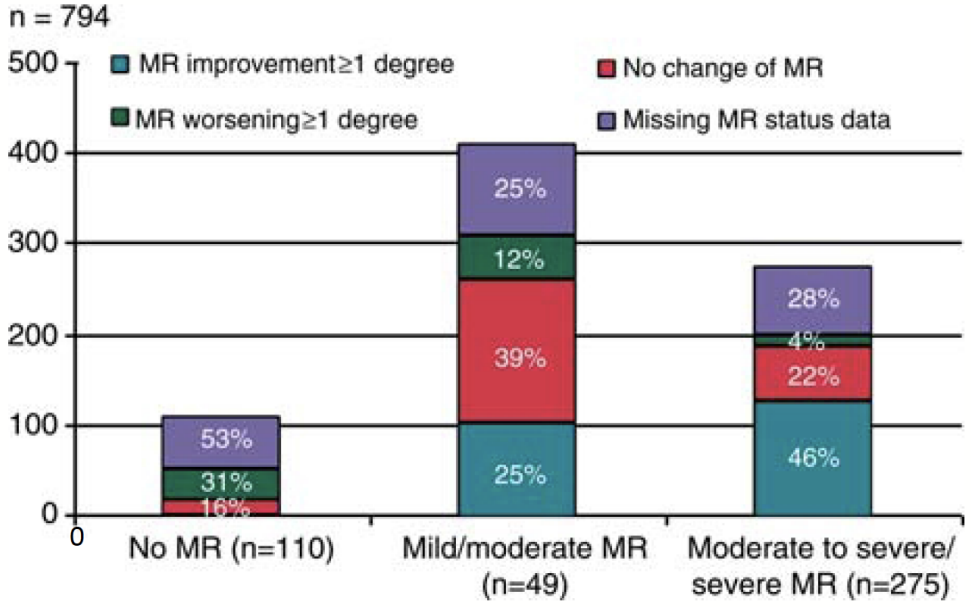
The greatest proportion of improvement in those with moderate/severe MR before CRT

MIRACLE Trial - Randomized



Abraham WT et al. N Engl J Med 2002;346:1845-53.

Effect of CRT on MR
A "Real World" Study



Biase LD et al. Europace 2011;13: 829–838

Why CRT for MR?

CRT MR Reduction and Outcome

Pts with less moderate/severe residual MR after CRT had better survival, Improved EF and Symptoms

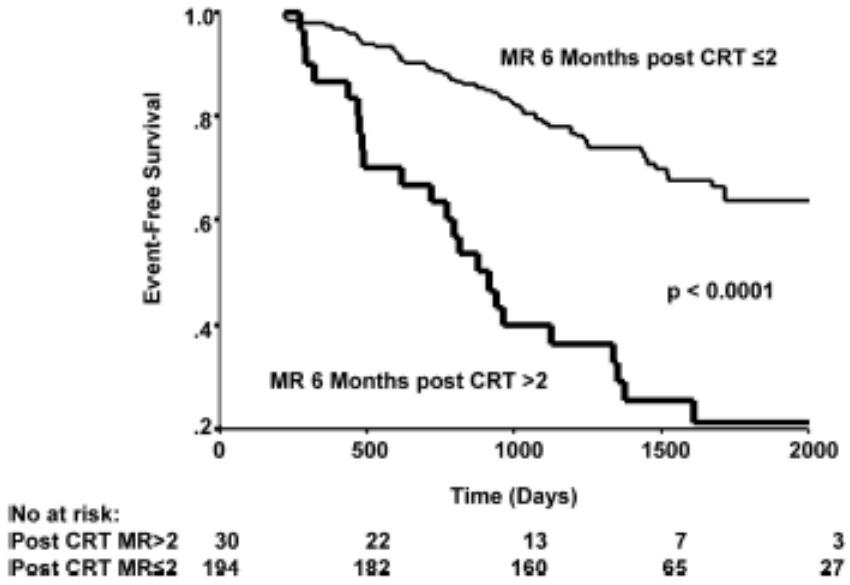


Table 4 Independent predictors of response to cardiac resynchronization therapy

Effect	Odds ratio	95% Confidence limits		*P* value
		Lower CL	Upper CL	
Baseline QRS	1.03	1.01	1.06	0.043
Pre-CRT LVEDD	0.95	0.93	0.97	<0.0001
Baseline MR	0.82	0.72	0.94	0.004
MR change at 3 months follow-up	1.27	1.04	1.55	0.019

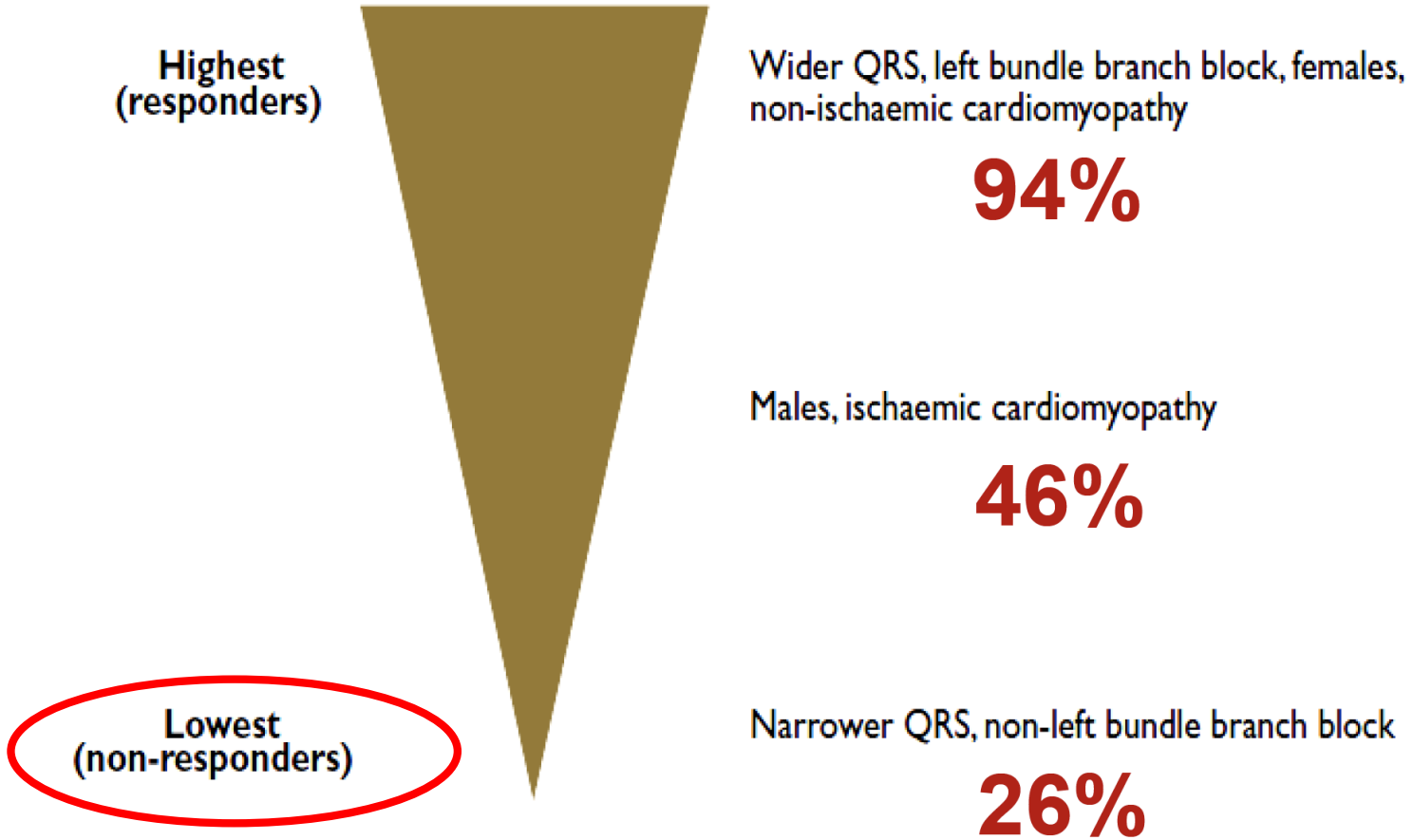
CRT, cardiac resynchronization therapy; CL, confidence limit; other abbreviations as in *Table 1*.

Verhaert D et al Circ CV Imaging 2012;5:21

Di Biase L et al Europace 2011;13:829

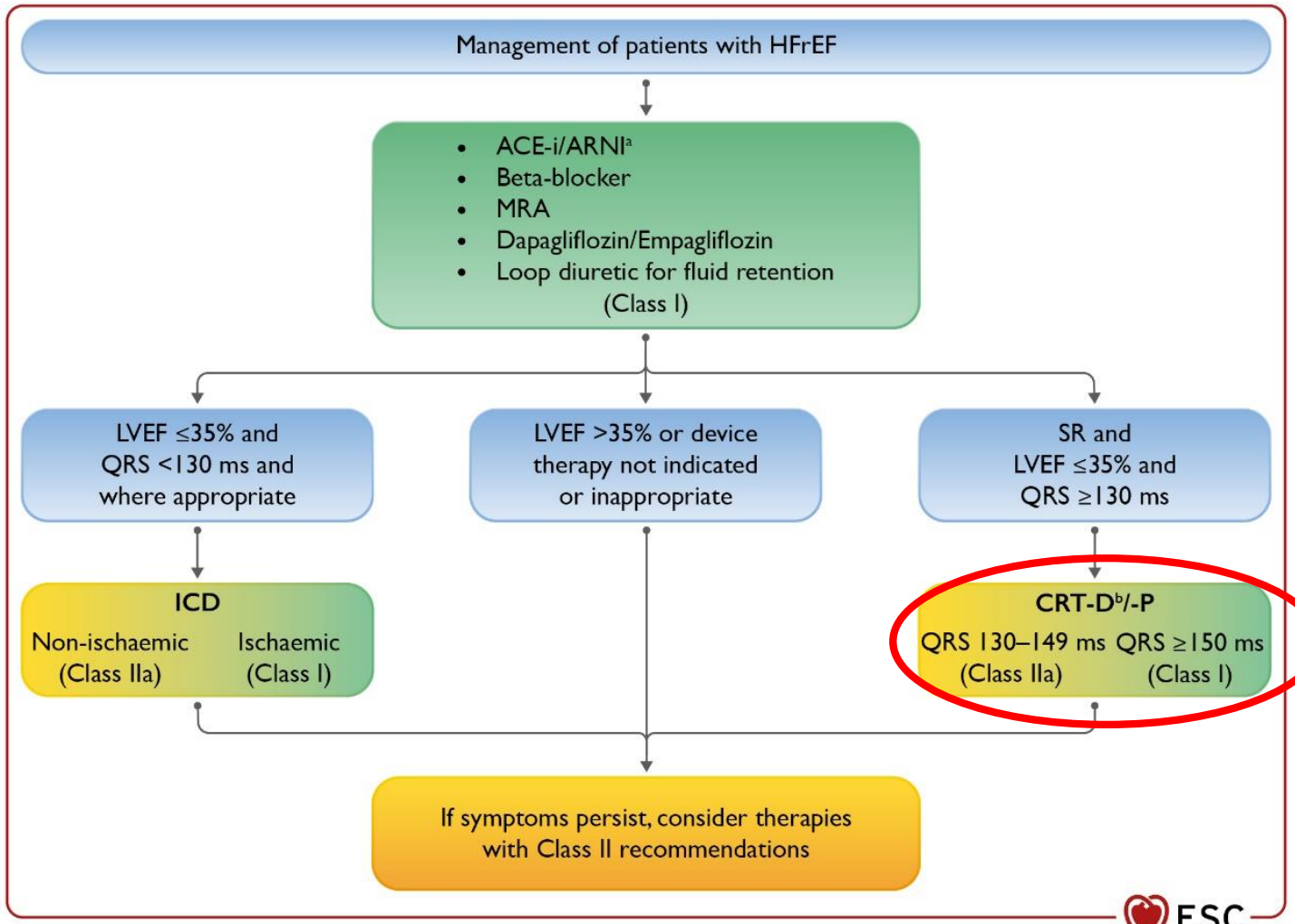
MR → 10 to 20 % reduction at 6 months

Magnitude of benefit from CRT



ESC guidelines 2013; **PREDICT CRT 2015**

Candidates for CRT

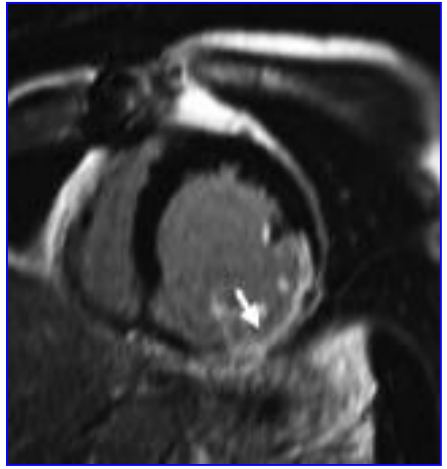


Recommendations for cardiac resynchronization therapy implantation in patients with heart failure

Recommendations	Class	Level
CRT is recommended for symptomatic patients with HF in SR with a QRS duration ≥150 ms and LBBB QRS morphology and with LVEF ≤35% despite OMT in order to improve symptoms and reduce morbidity and mortality.	I	A
CRT should be considered for symptomatic patients with HF in SR with a QRS duration of 130–149 ms and LBBB QRS morphology and with LVEF ≤35% despite OMT in order to improve symptoms and reduce morbidity and mortality.	I	B
CRT should be considered for symptomatic patients with HF in SR with a QRS duration ≥150 ms and non-LBBB QRS morphology and with LVEF ≤35% despite OMT in order to improve symptoms and reduce morbidity and mortality.	IIa	B
CRT may be considered for symptomatic patients with HF in SR with a QRS duration of 130–149 ms and non-LBBB QRS morphology and with LVEF ≤35% despite OMT in order to improve symptoms and reduce morbidity and mortality.	IIb	B
CRT is not recommended in patients with a QRS duration <130 ms who do not have an indication for pacing due to high degree AV block.	III	A

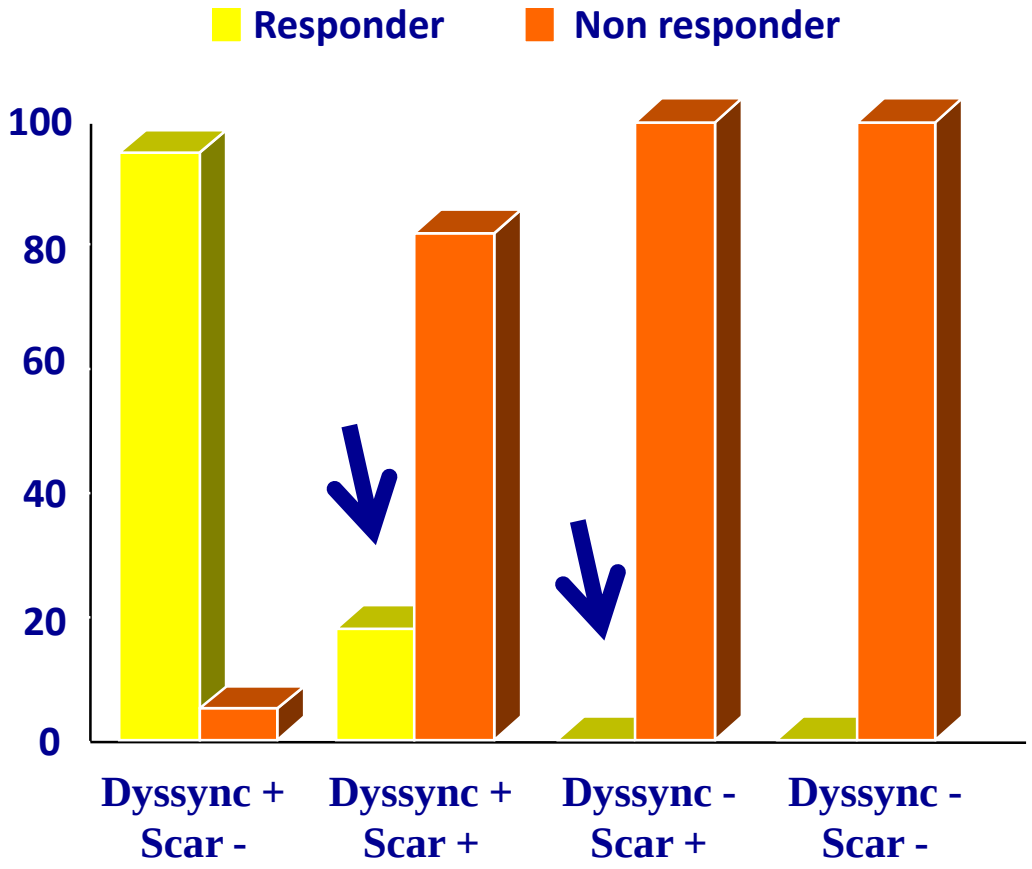
AF = atrial fibrillation; AV = atrio-ventricular; CRT = cardiac resynchronization therapy; HF = heart failure; HFrEF = heart failure with reduced ejection fraction; ICD = implantable cardioverter-defibrillator; LBBB = left bundle branch block; LVEF = left ventricular ejection fraction; NYHA= New York Heart Association; OMT= optimal medical therapy (class I recommended medical therapies for at least 3 months); QRS =Q, R, and S waves (combination of three of the graphical deflections); RV = right ventricular; SR = sinus rhythm.

Scar Tissue at the LV Lead Tip



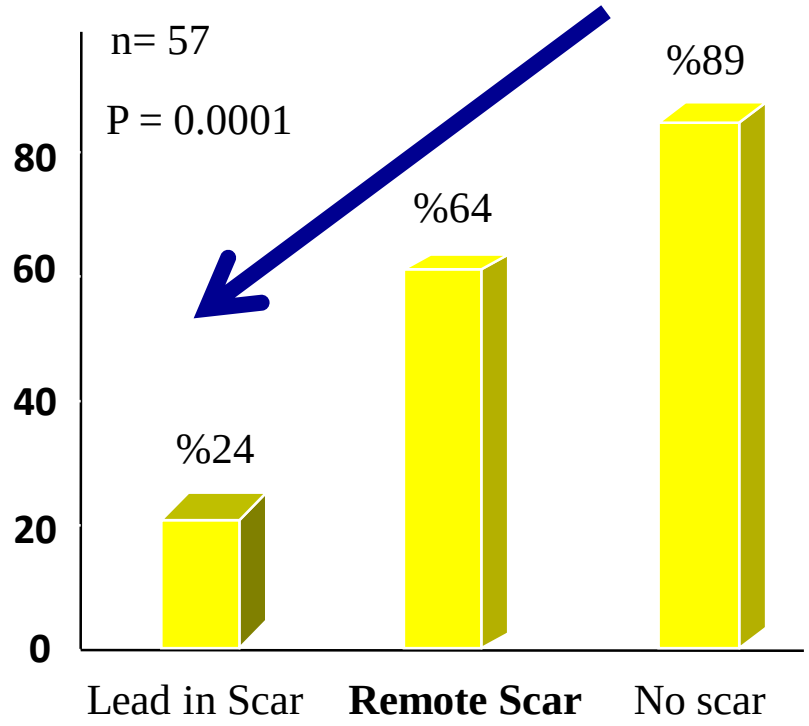
n = 40

Clinical Response



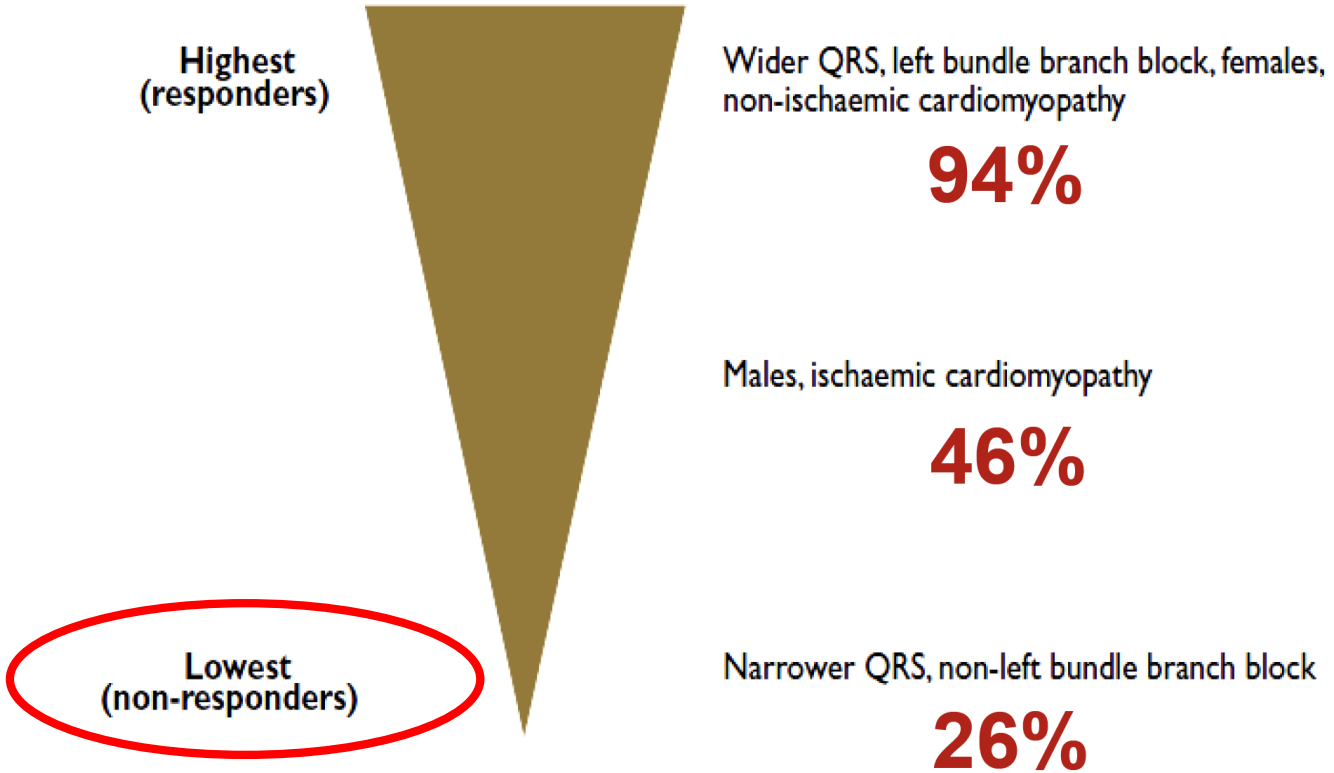
Bleeker G. Circulation 2006;113:969

Reverse remodeling at 3 months



Jansen A, Eur J Echocardiogr. 2008;9:483

Magnitude of benefit from CRT

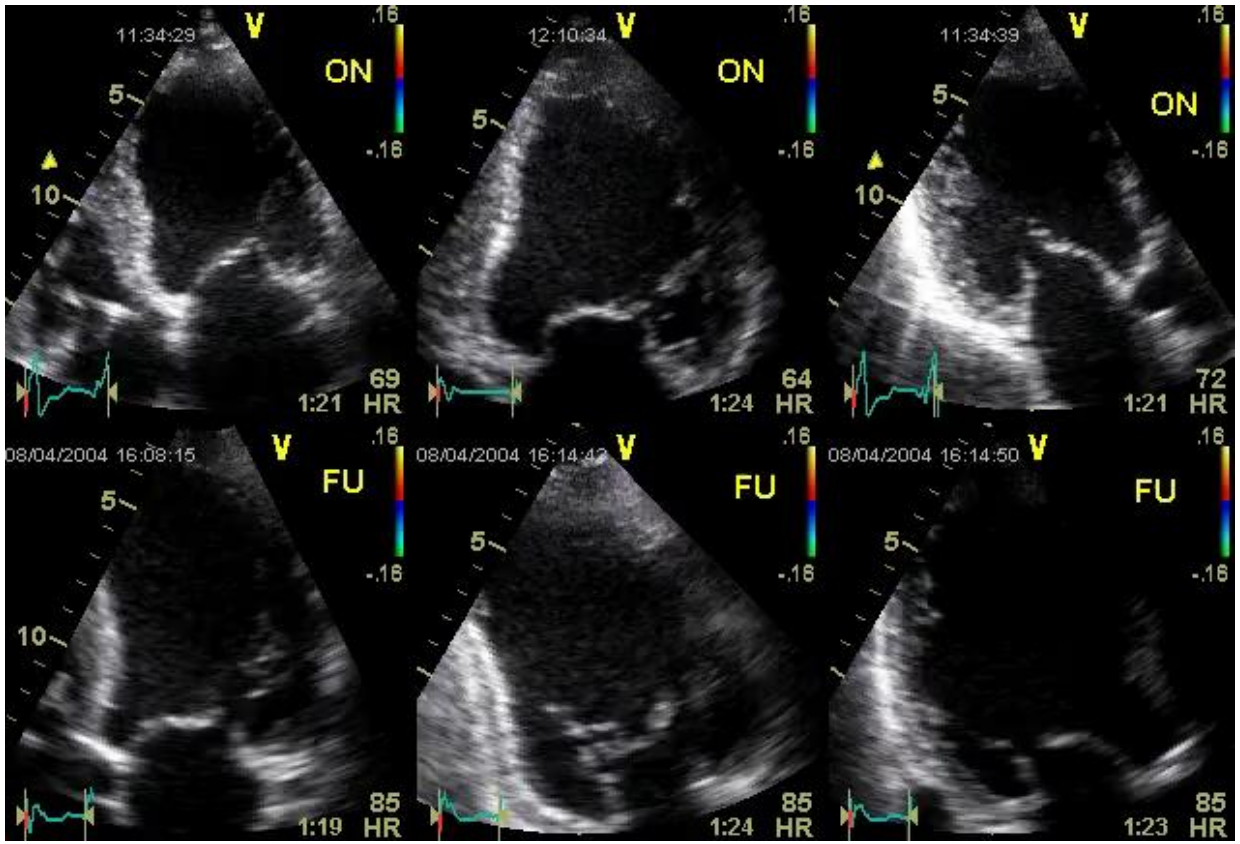


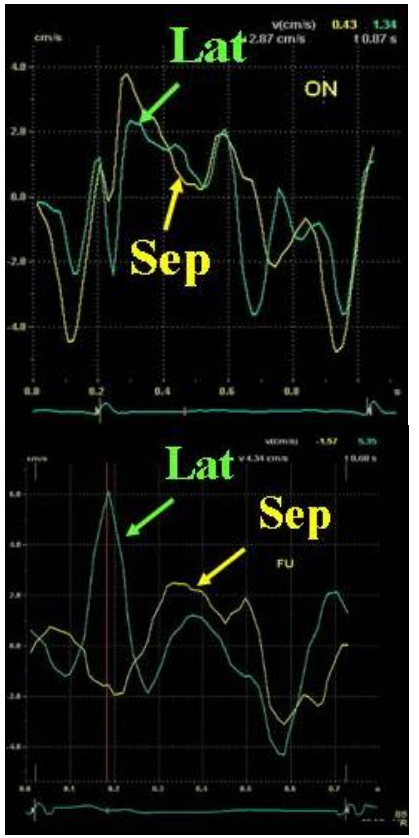
ESC guidelines 2013; **PREDICT CRT 2015**

- Absence of significant LV dyssynchrony
- LV lead mismatch (vs. site of latest mechanical activation)

Progression of the disease

Back a year later in severe heart failure





Candidates for CRT

OUR CASE

CRT is not a good option in this patient