Multipoint, automatic CRT option: dream or reality ?

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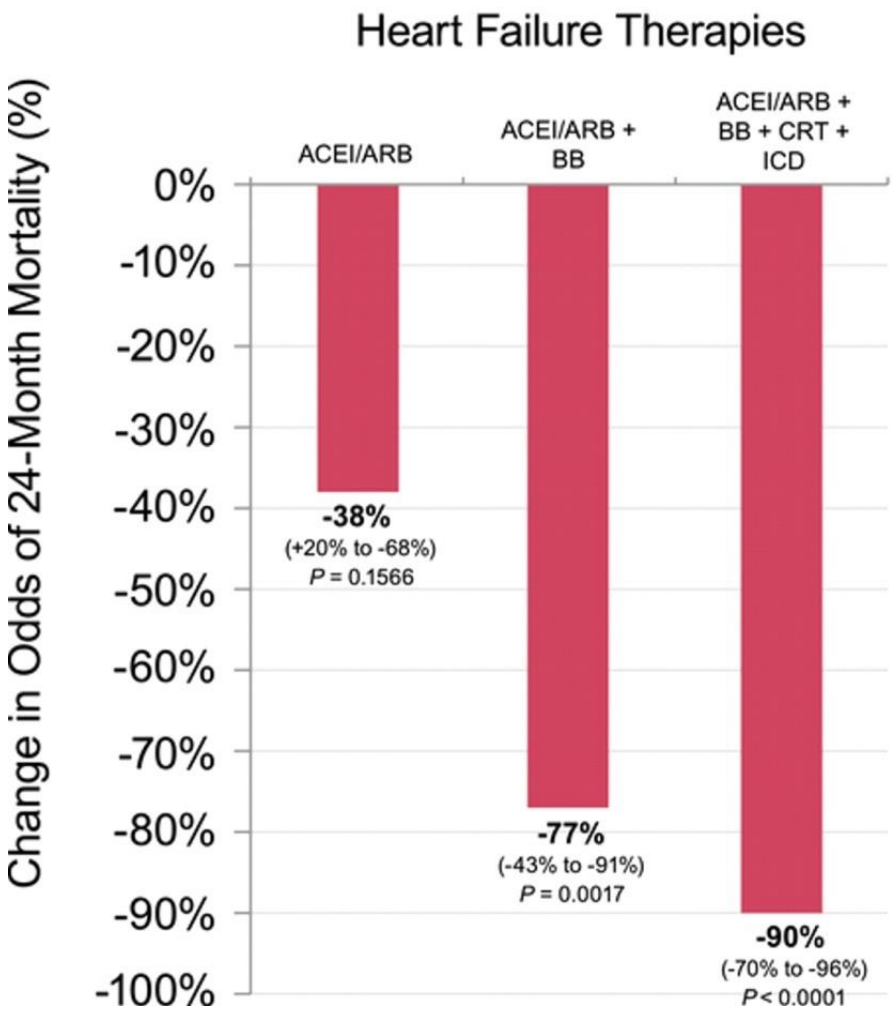
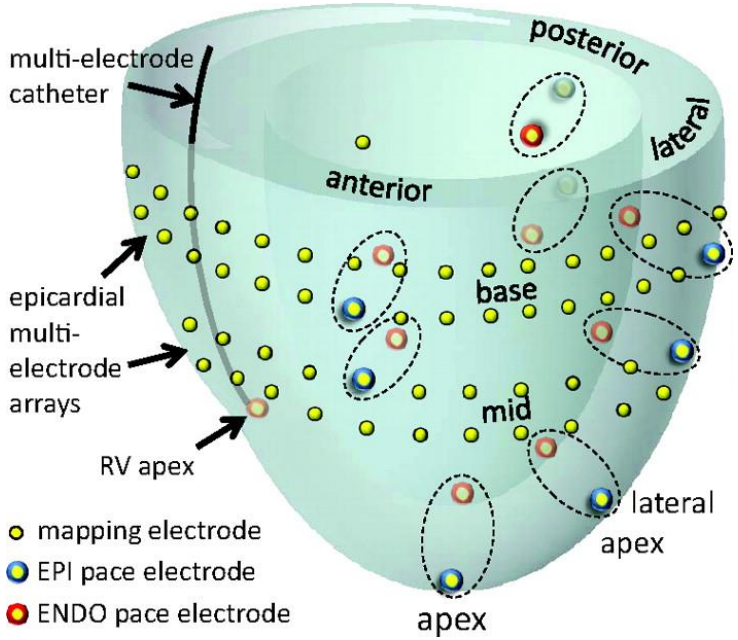
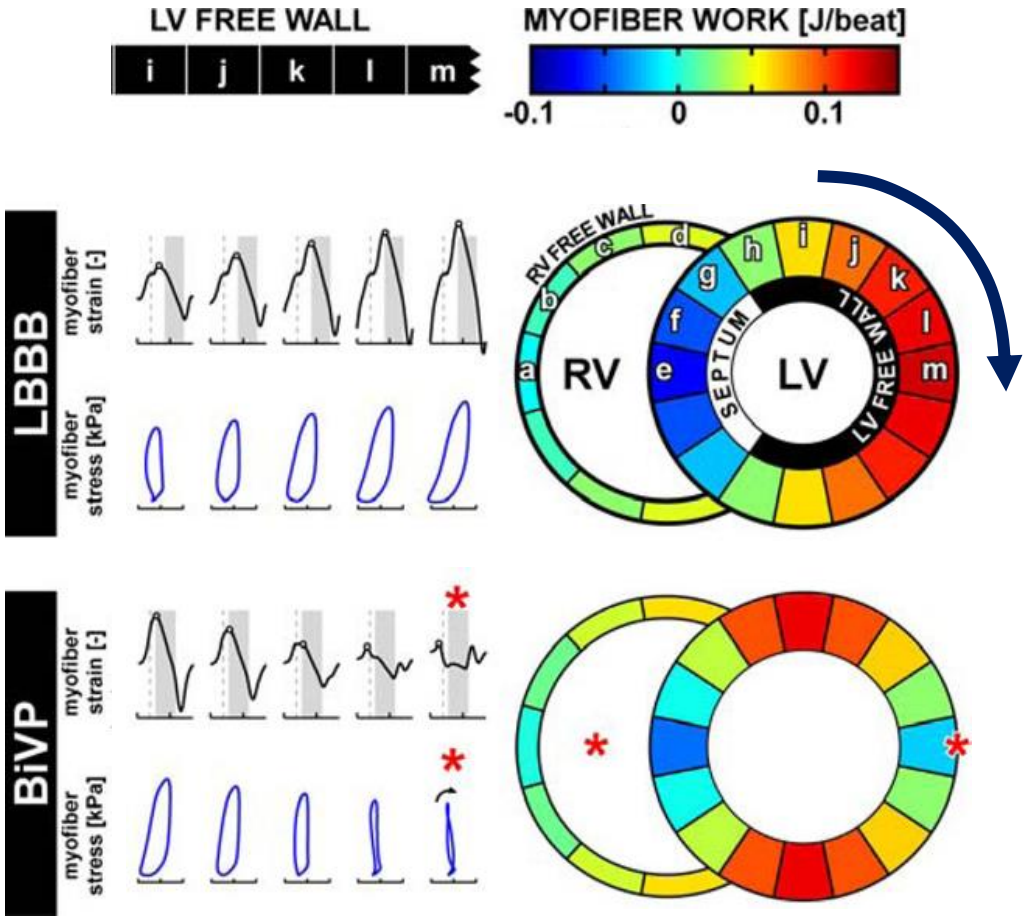
Incremental benefit of device therapy



Fonarow G C et al. JAHA 2012;1:16-26

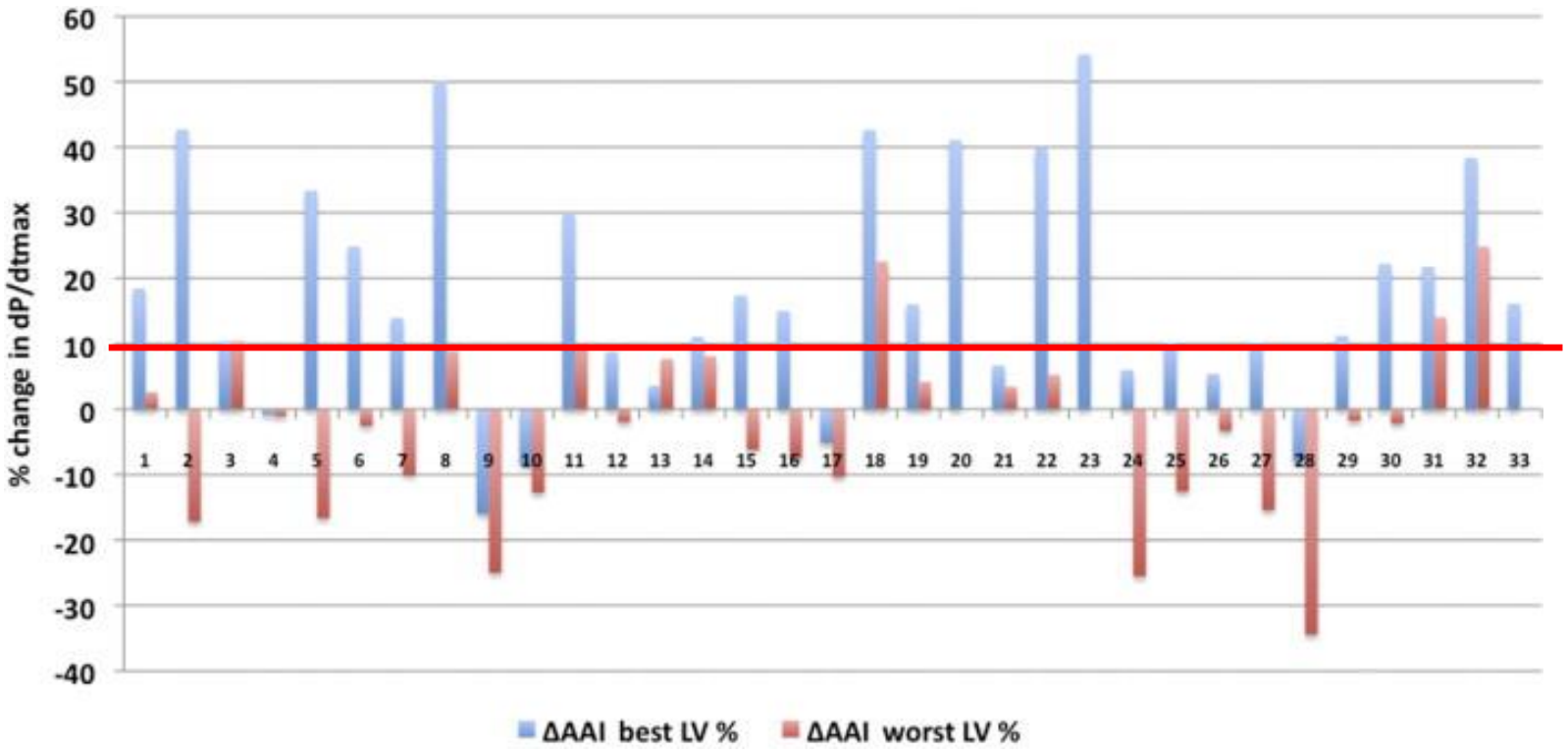
Individual response to epicardial LV sites





Strik M, et al. Circ Arrhythm Electrophysiol. 2012;5:191-200

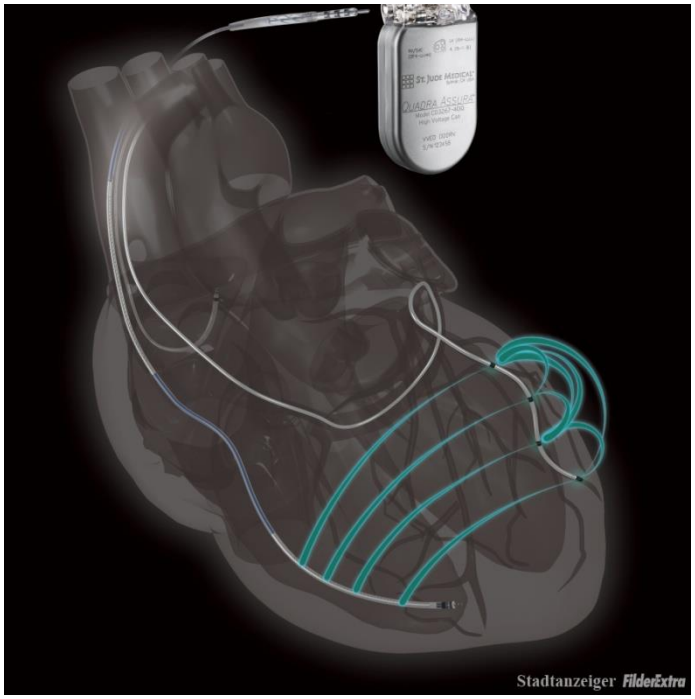
Individual response to epicardial LV sites

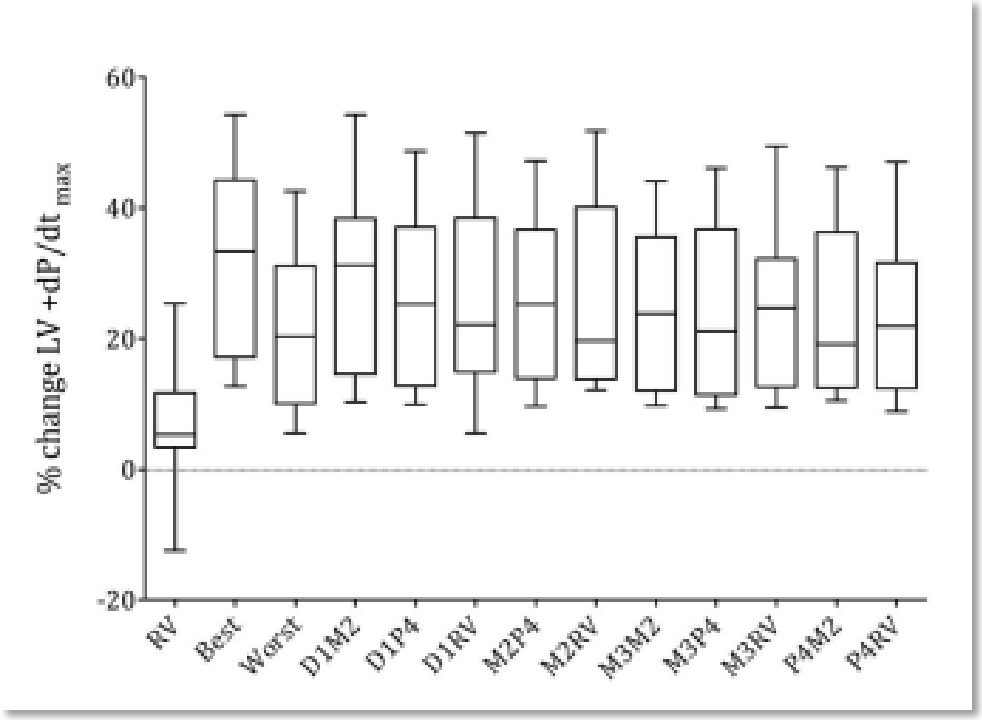


Duckett SG, et al. J Am Coll Cardiol. 2011;58(11):1128-1136

Individual response to epicardial LV sites

NYHA II-IV
DCM in 12/16 patients
OPT
LVEF ≤35%
SR, LBBB (QRS >130 ms)

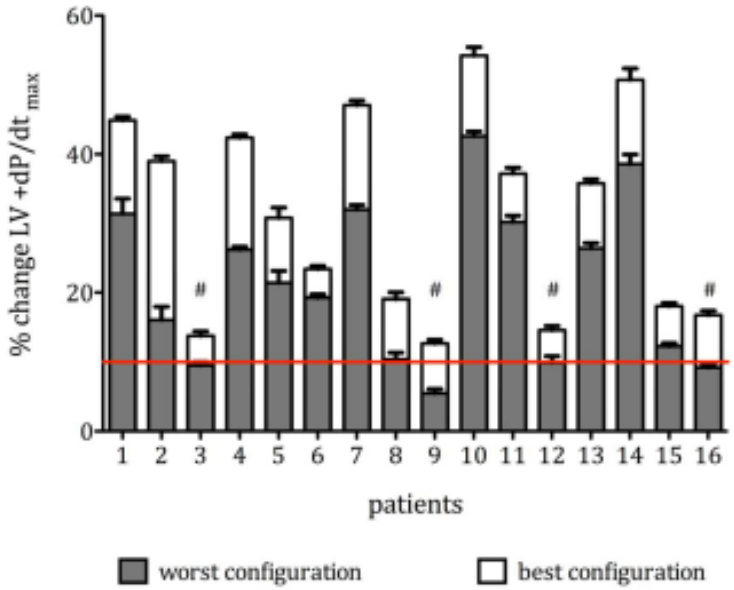




Asbach S, et al. PLOS one 2013;8:e67235

Individual response to epicardial LV sites

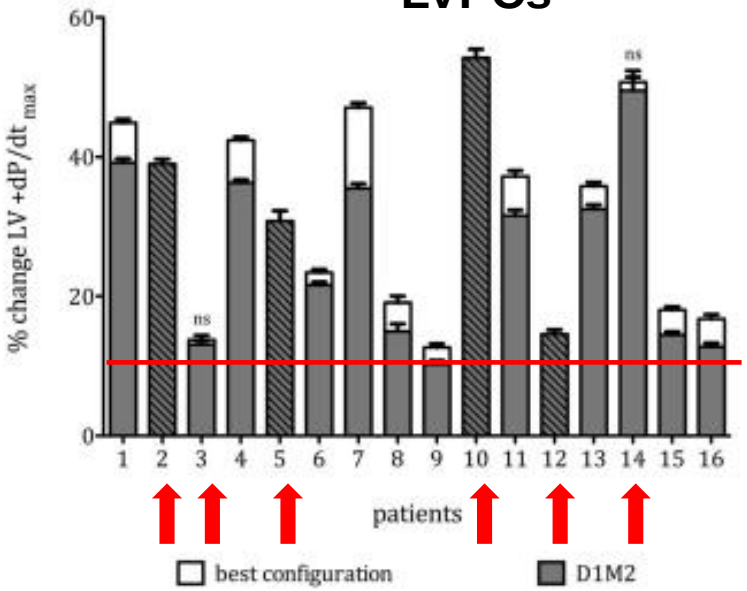
Optimal and worst LVPCs



4 patients were transformed into responders

But, most responded to 'worst'

Optimal and distal (conventional) LVPCs



Better response with 'optimal' in 10/16

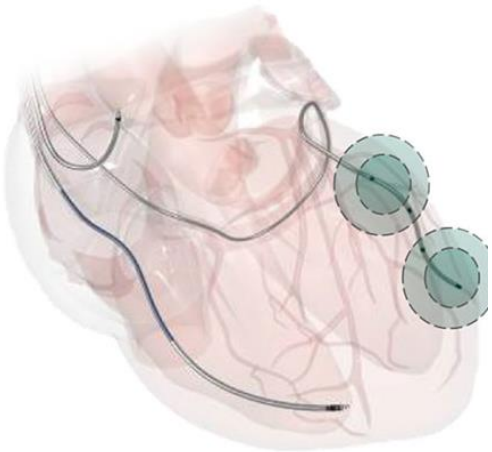
But, distal LVPC (conventional CRT) still achieved response in 15/16

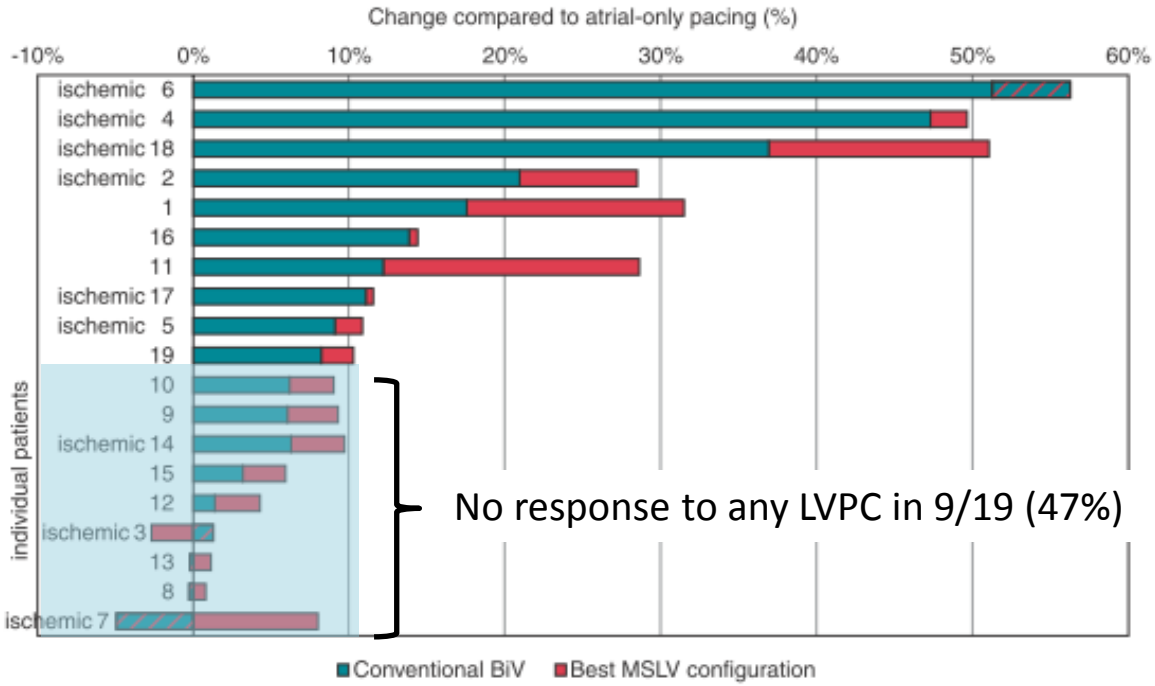
Asbach S, et al. PLOS one 2013;8:e67235

MPP

BiV pacing, using the LV lead's distal D1 electrode in extended bipolar configuration

Simultaneous MPP using two or more LV electrodes as cathodes





Distal/proximal multisite pacing was the most common optimal configuration, superior to BiV in 74% of patients.

Thibault B, et al. Europace 2013;12:984-991

3P-MPP over LV free wall scar

MAESTRO study

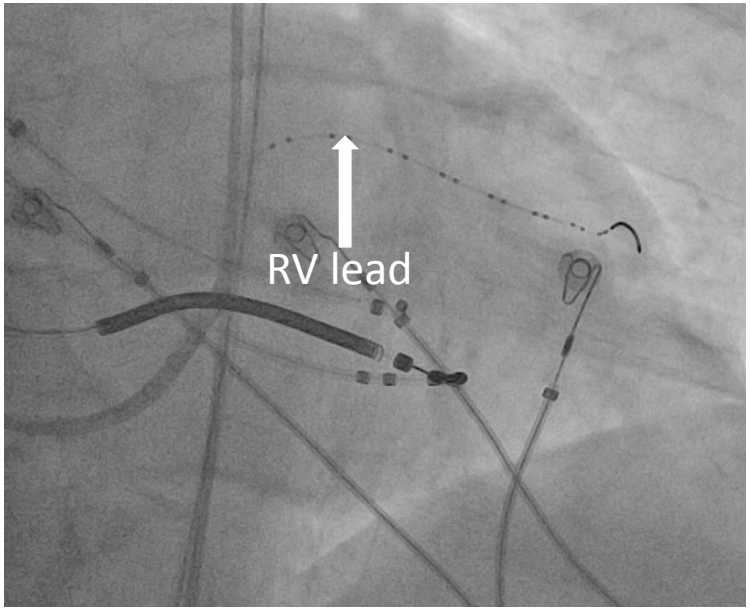
NYHA II-IV

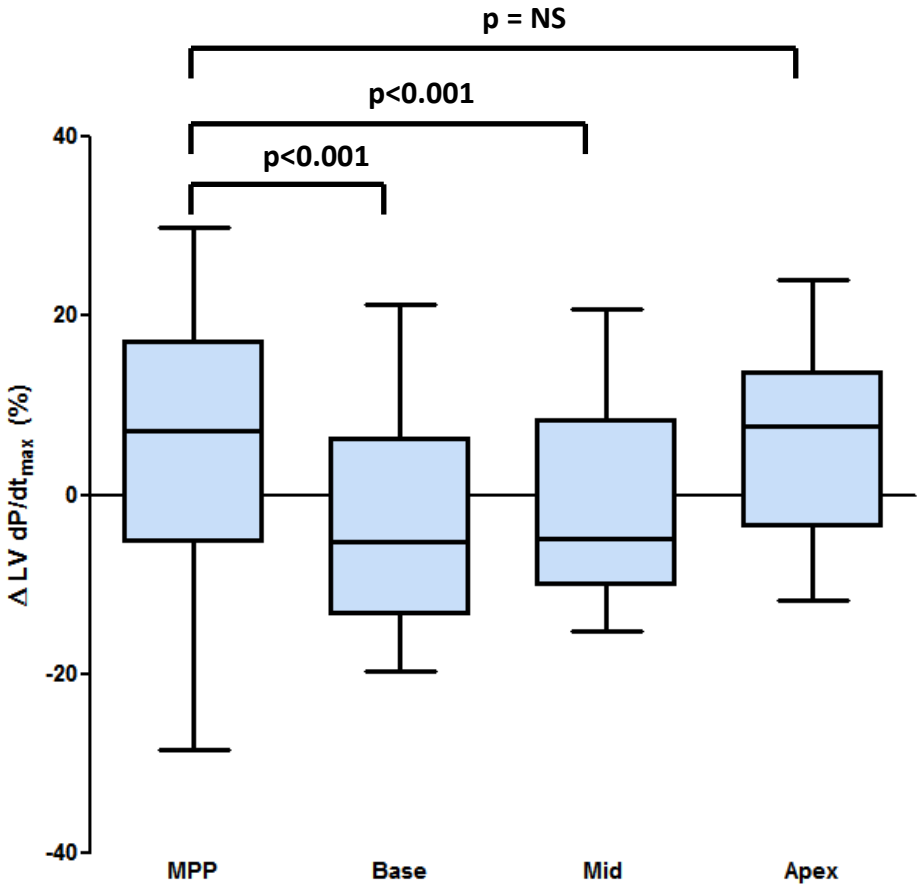
All ICM with LV free wall scar

OPT

LVEF ≤35%

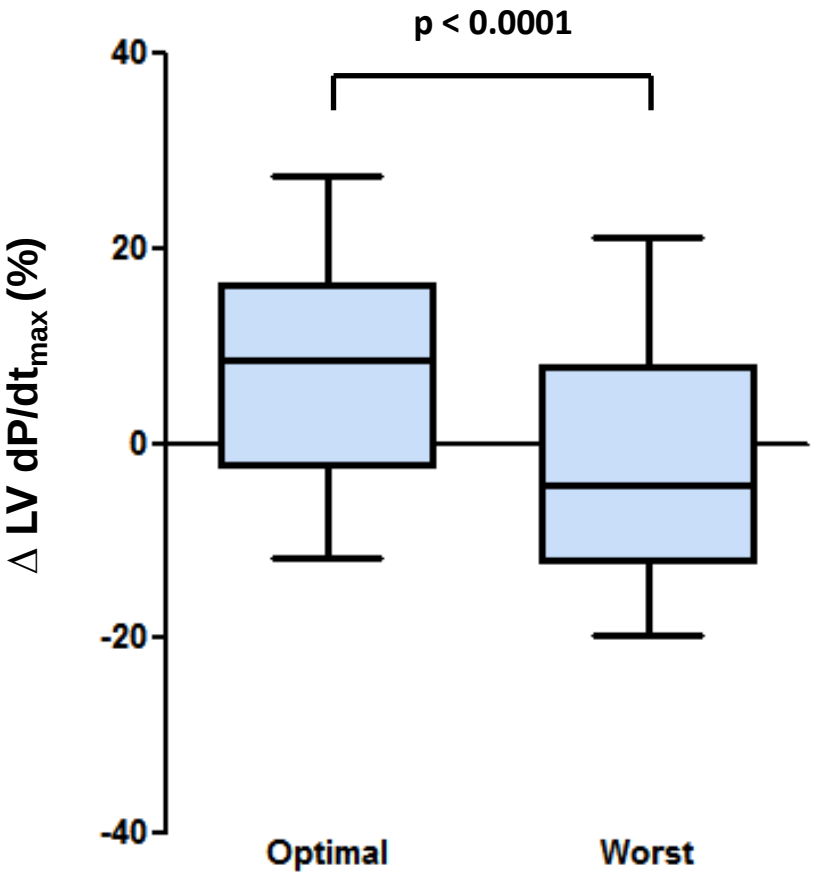
SR, LBBB (QRS >130 ms)





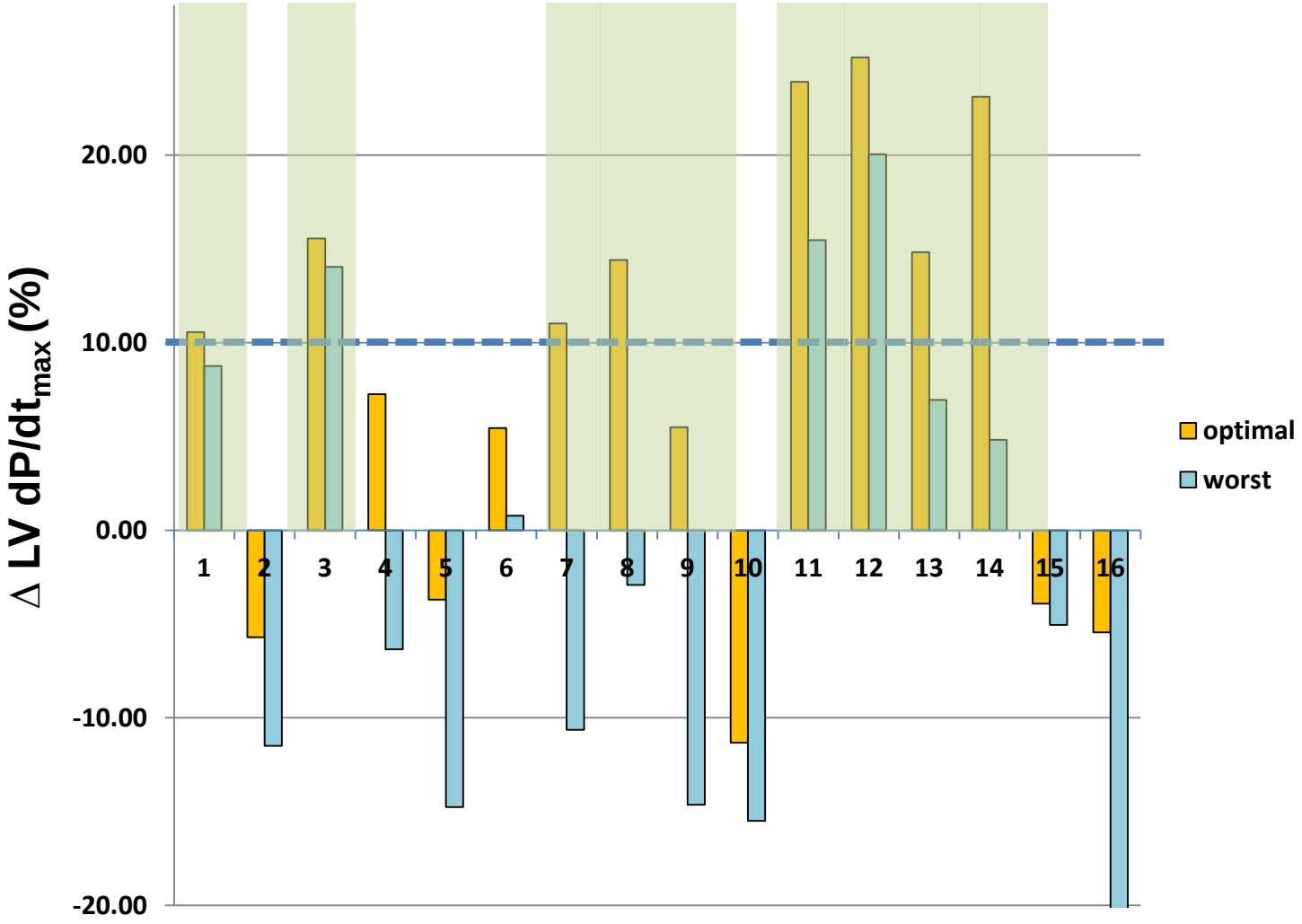
Umar F, et al. HRJ 2015

Optimal versus worse LVPC



Umar F, et al. HRJ 2015

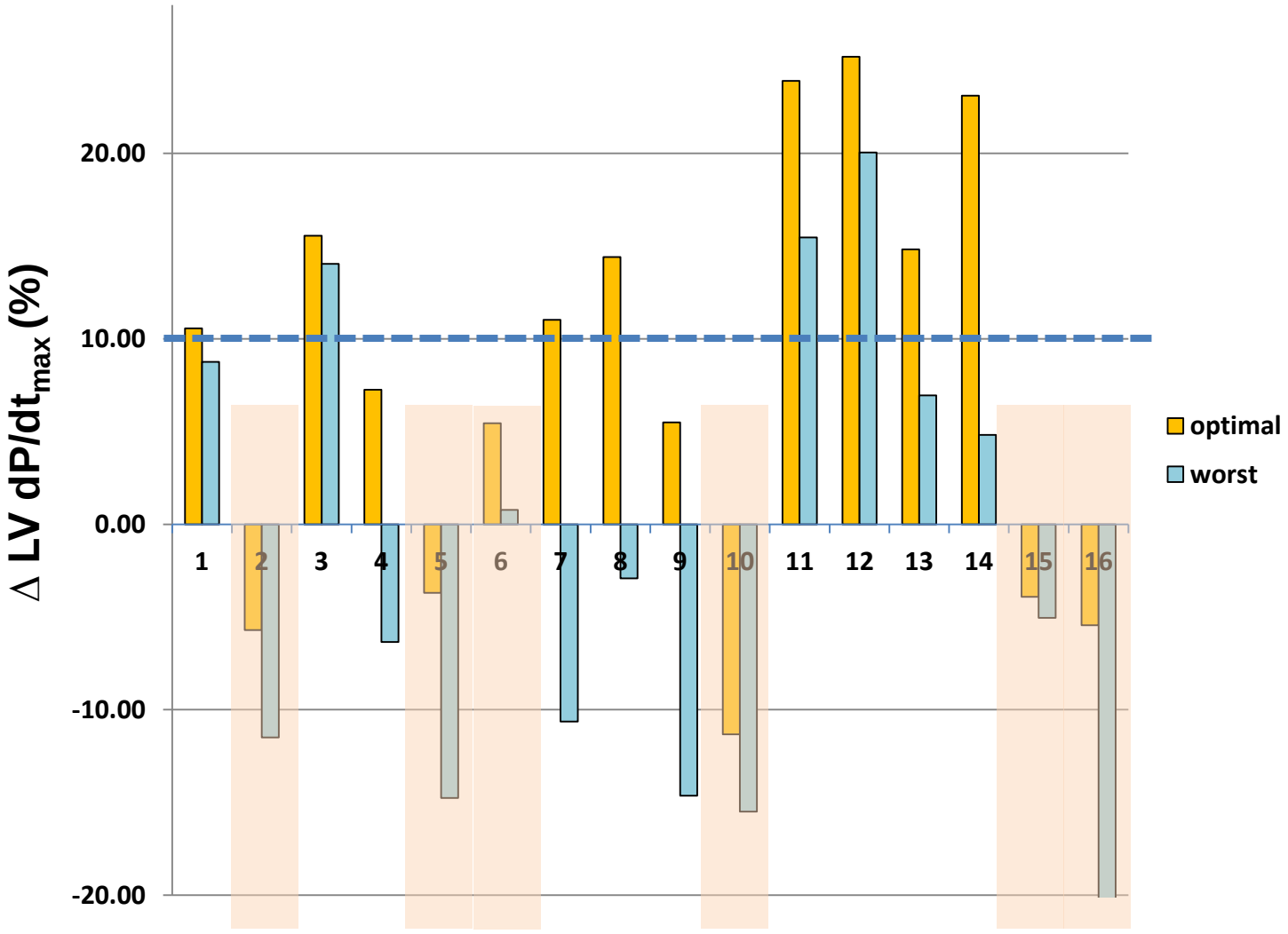
Varying response to different LVPCs



Difference in response: optimal vs worst

Umar F, et al. HRJ 2015

No response with any LVPC

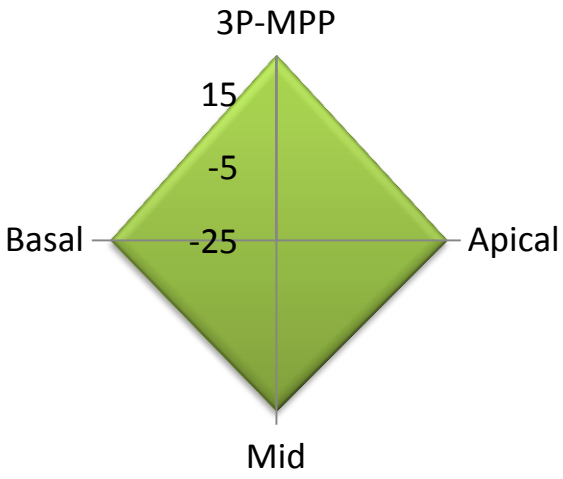


No response or negative response to all LVPCs

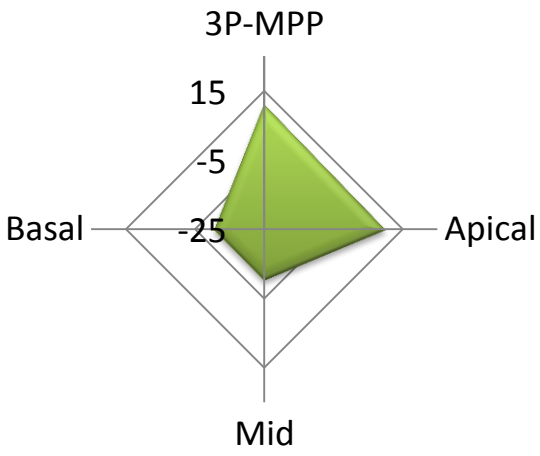
Umar F, et al. HRJ 2015

Patient phenotypes

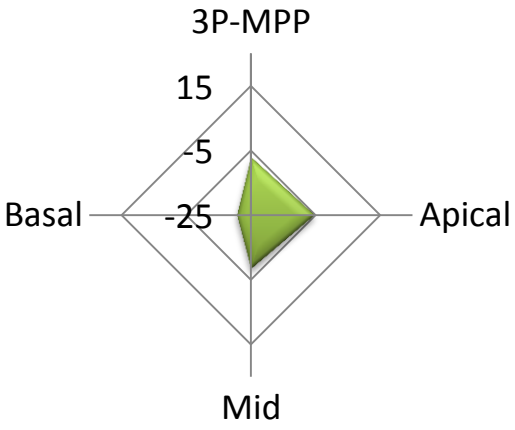
UNIVERSAL RESPONDERS



PARTIAL RESPONDERS

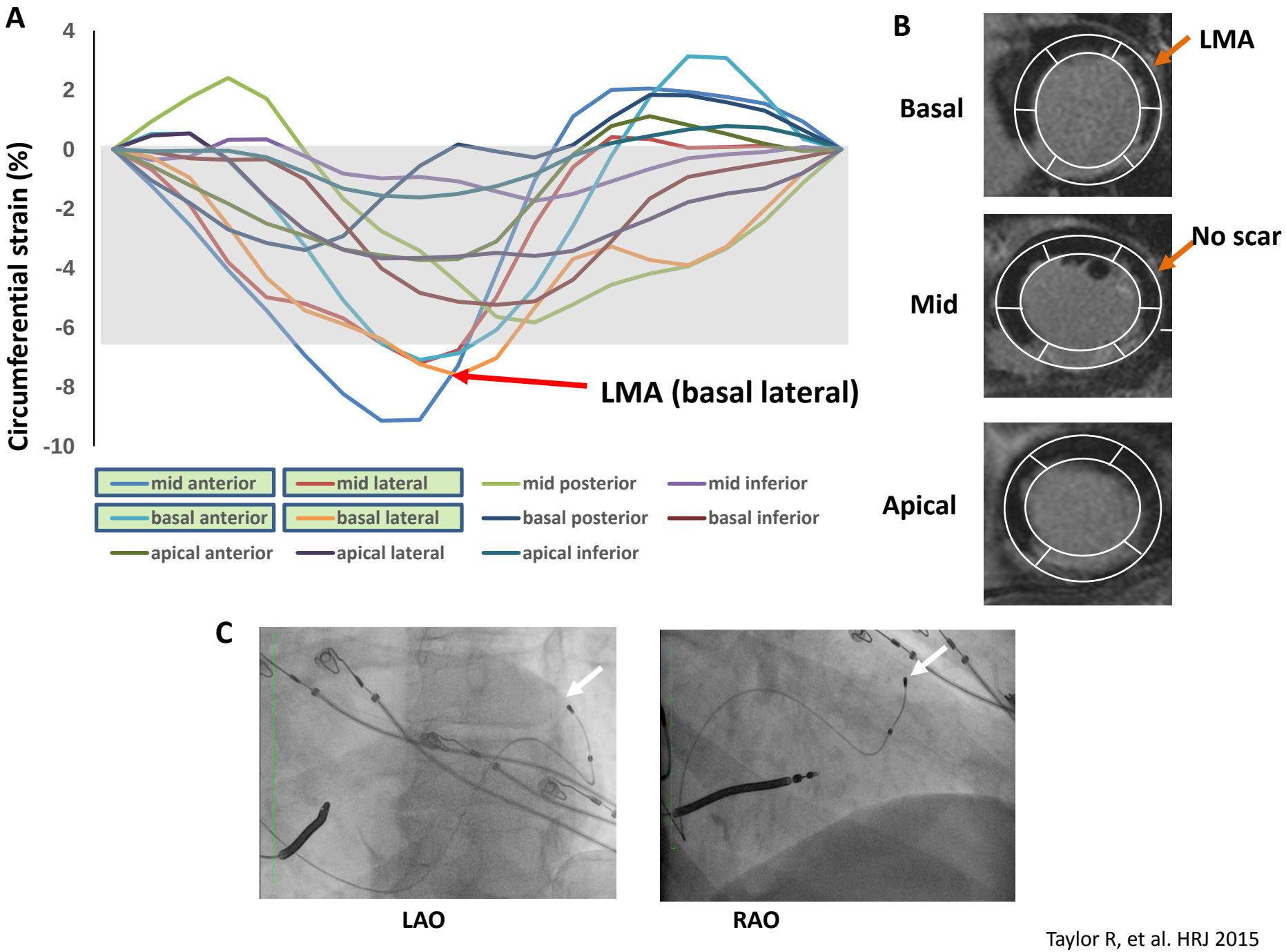


UNIVERSAL NON-RESPONDERS



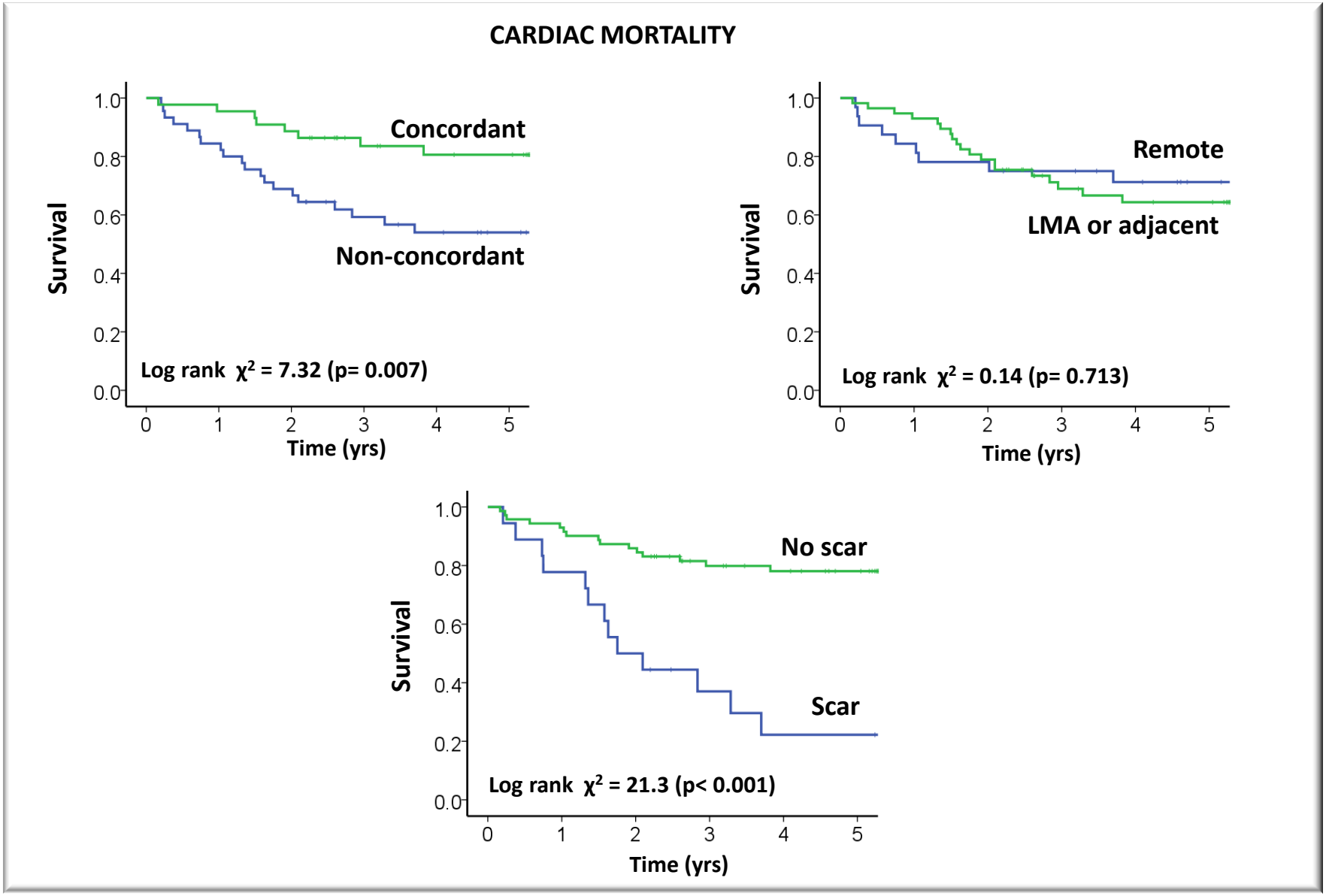
Umar F, et al. HRJ 2015

Scar and CRT



Taylor R, et al. HRJ 2015

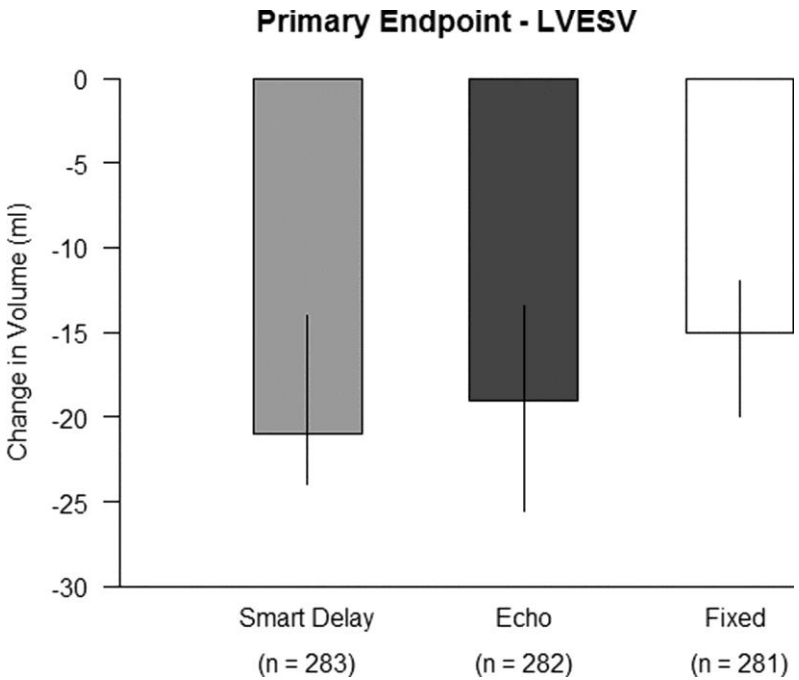
Latest mechanical activation and scar

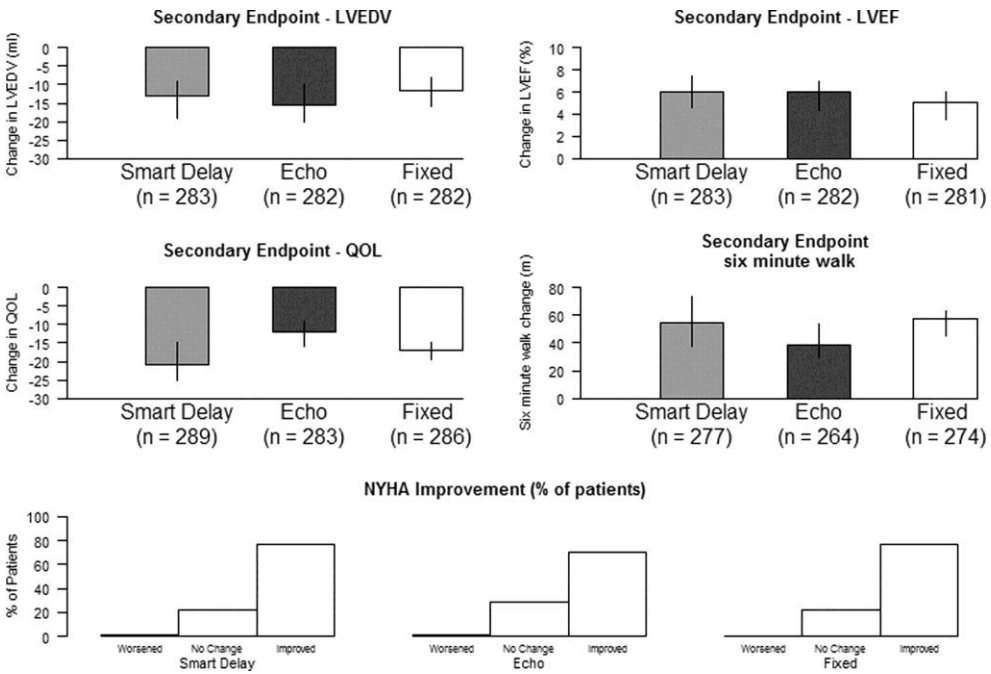


Taylor R, et al. HRJ 2015

AV optimisation

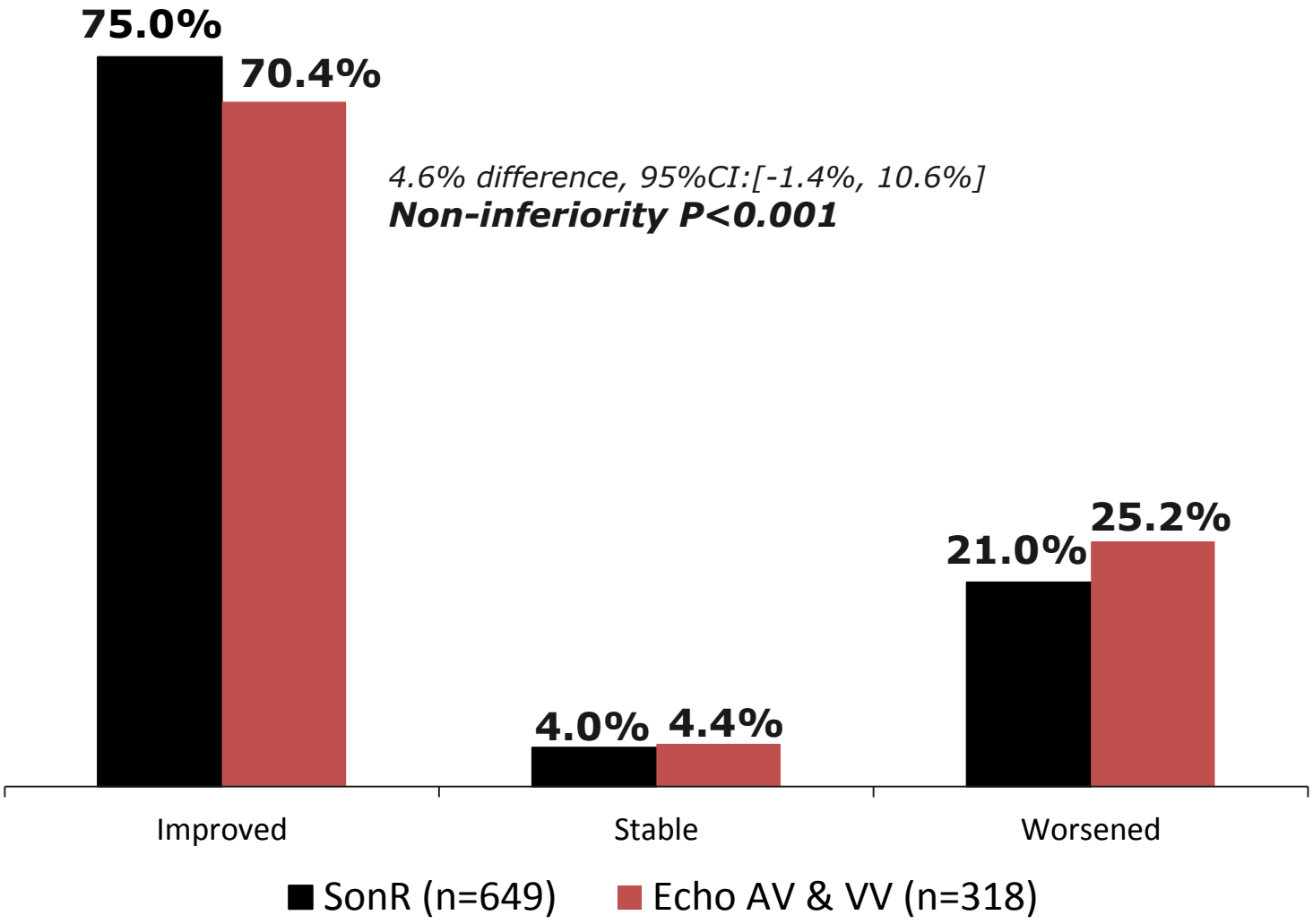
Comparison of echo and device-based optimisation with fixed approach





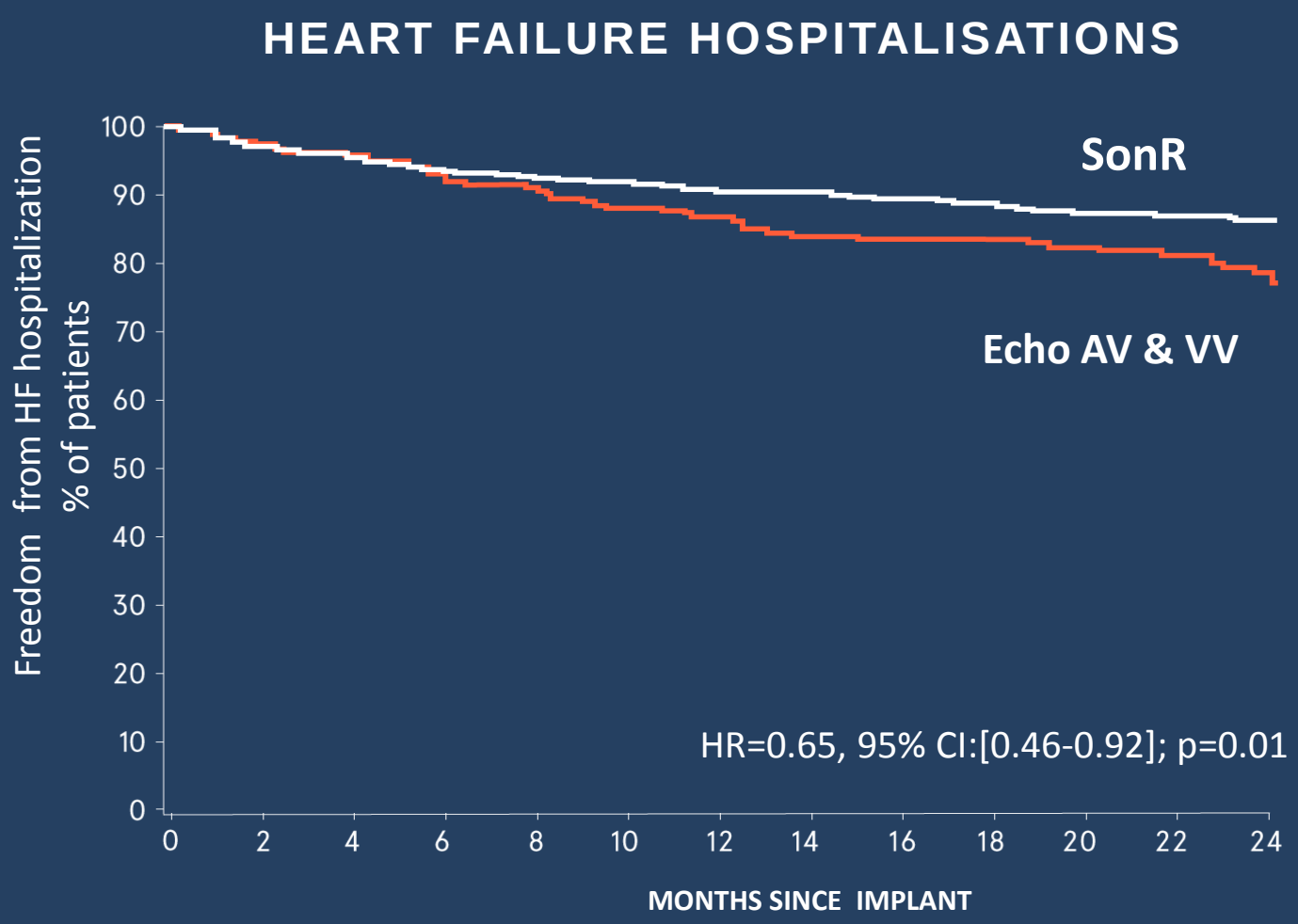
Ellenbogen K A et al. Circulation. 2010;122:2660-2668

RESPOND: SonR vs echo optimisation



Eur Heart J 2016. In press.

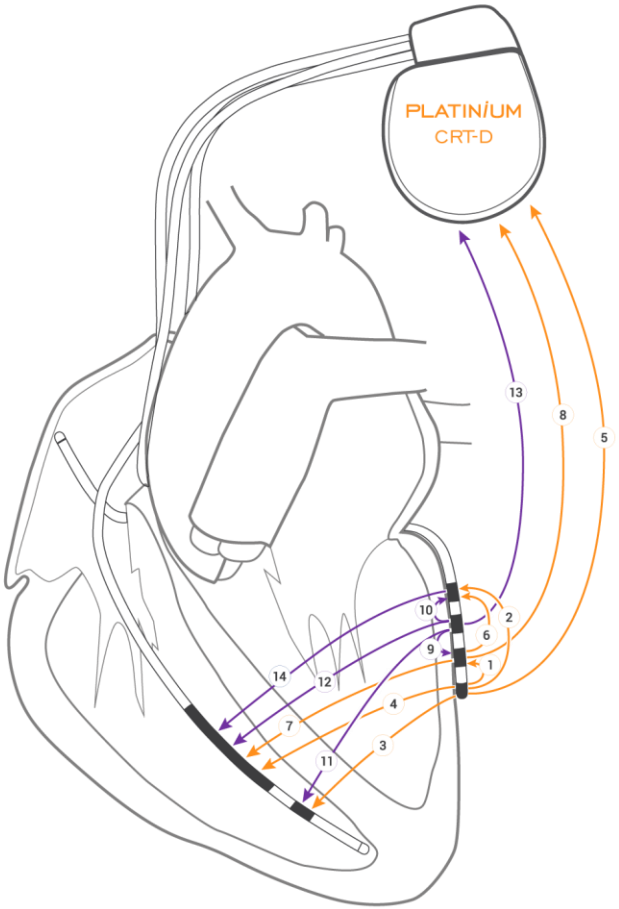
RESPOND: automatic AV/VV optimisation



35% risk reduction in HF hospitalization

Eur Heart J 2016. In press.

Multipoint LV pacing

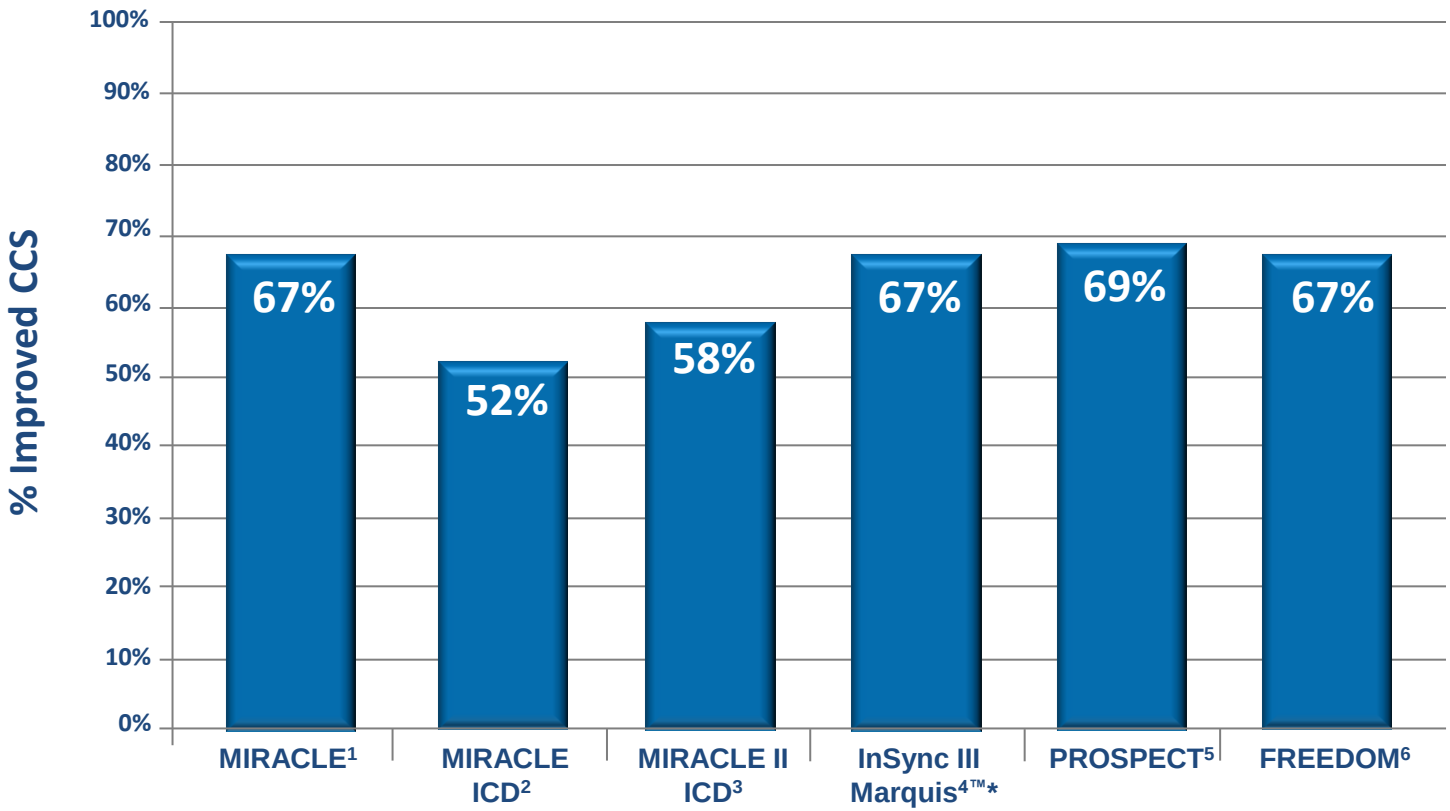


1. LVtip1 to LV2
2. LVtip1 to LV4
3. LVtip1 to RVring
4. LVtip1 to RVcoil
5. LVtip1 to CAN
6. LV2 to LV4
7. LV2 to RVcoil
8. LV2 to CAN
9. LV3 to LV2
10. LV3 to LV4
11. LV3 to RVring
12. LV3 to RVcoil
13. LV3 to CAN
14. LV4 to RVcoil

Conclusions

- There are varying response ‘phenotypes’ to CRT
- Haemodynamic optimisation of LVPCs may confer a clinical benefit
- Automatic, haemodynamic optimisation of LVPCs requires further investigation

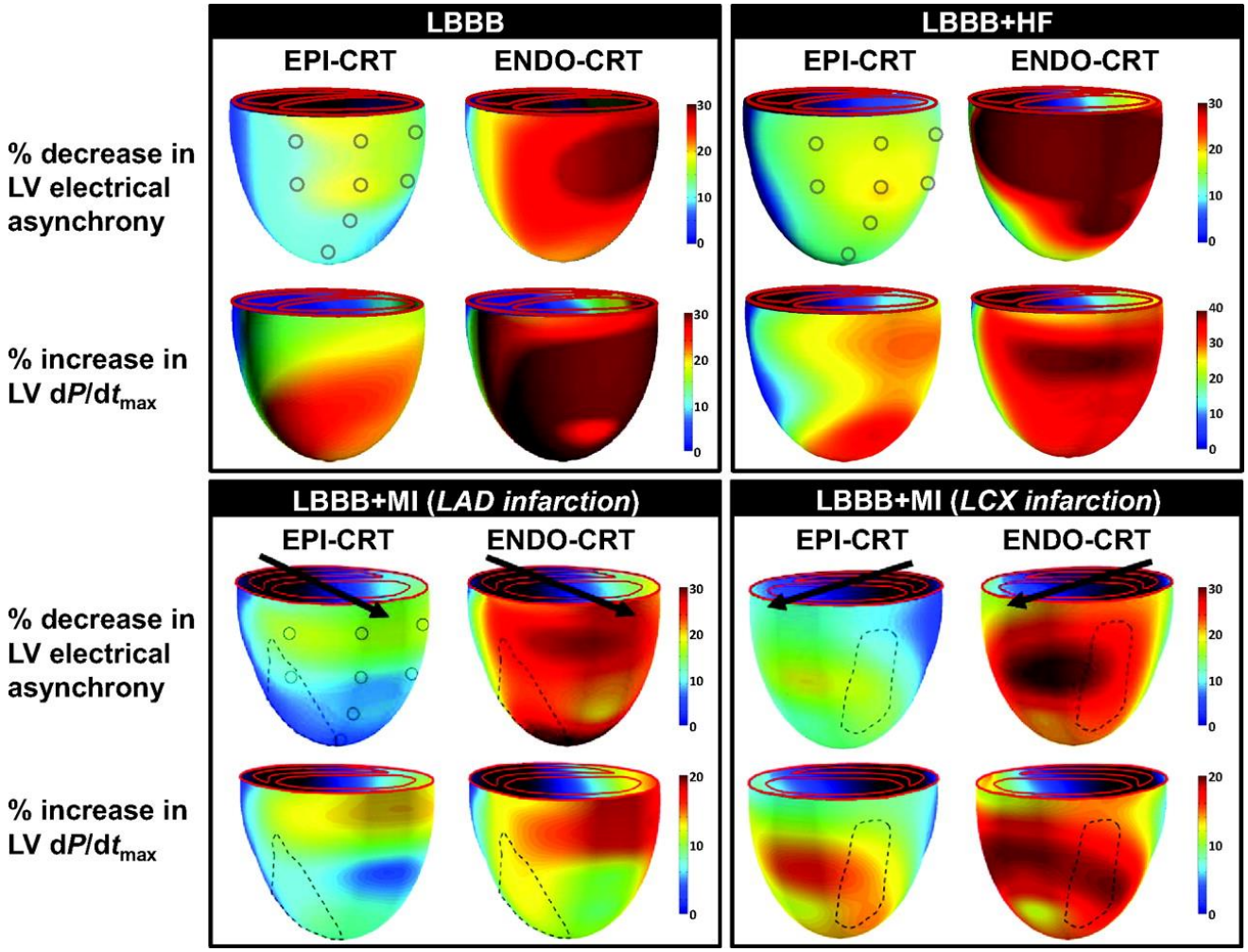
CRT response



[1] Abraham WT, et al. *N Engl J Med*. 2002;346:1845-1853.
[2] Young JB, et al. *JAMA*. 2003;289:2685-2694.
[3] Abraham WT, et al. *Circulation*. 2004;110:2864-2868.
[4] Abraham WT, et al. *Heart Rhythm*. 2005;2:S65.
[5] Chung ES, et al. *Circulation.* 2008;117:2608-2616.
[6] Abraham WT, et al. *Late-Breaking Clinical Trials.* HRS 2010.

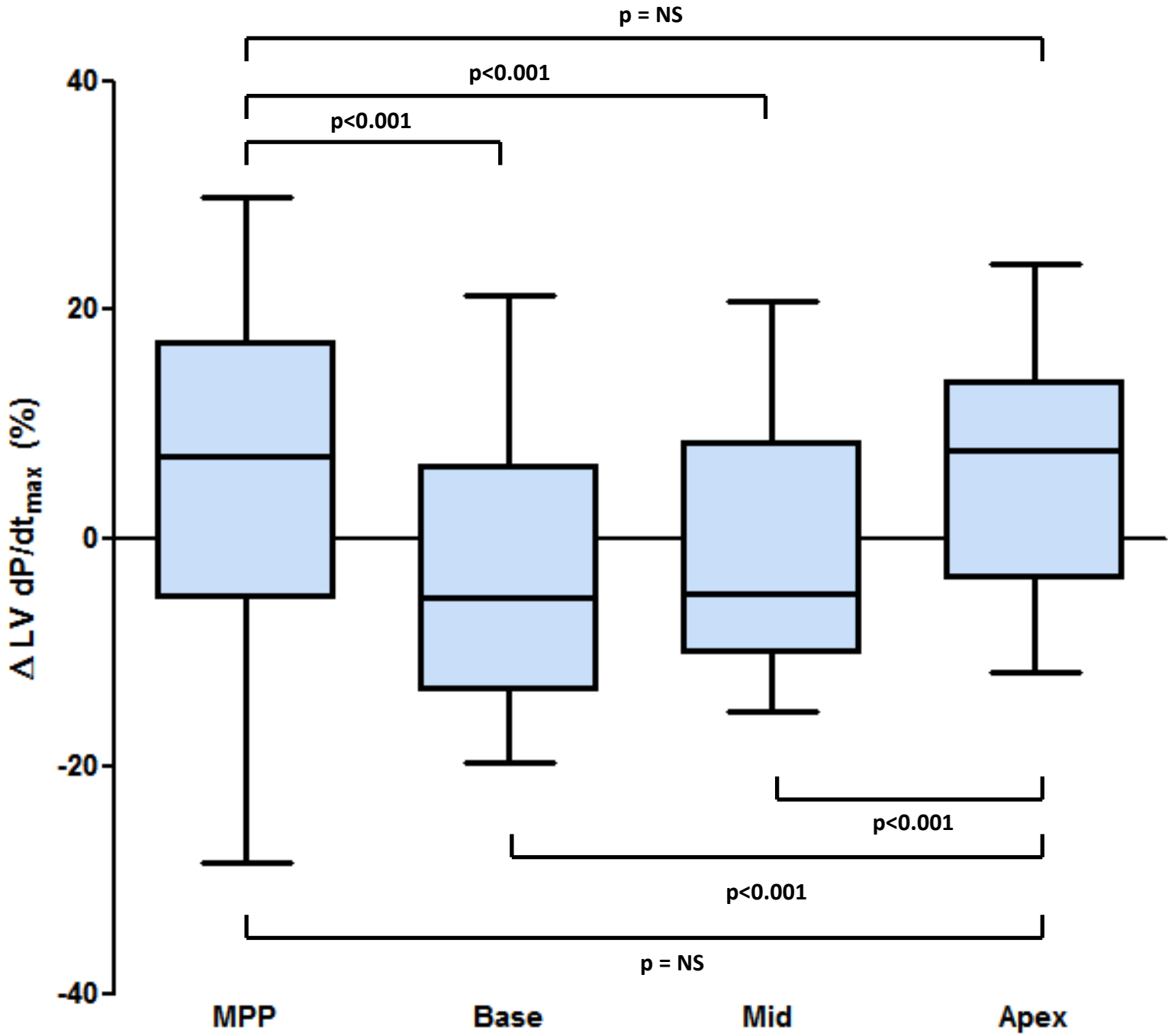
Endocardial LV pacing

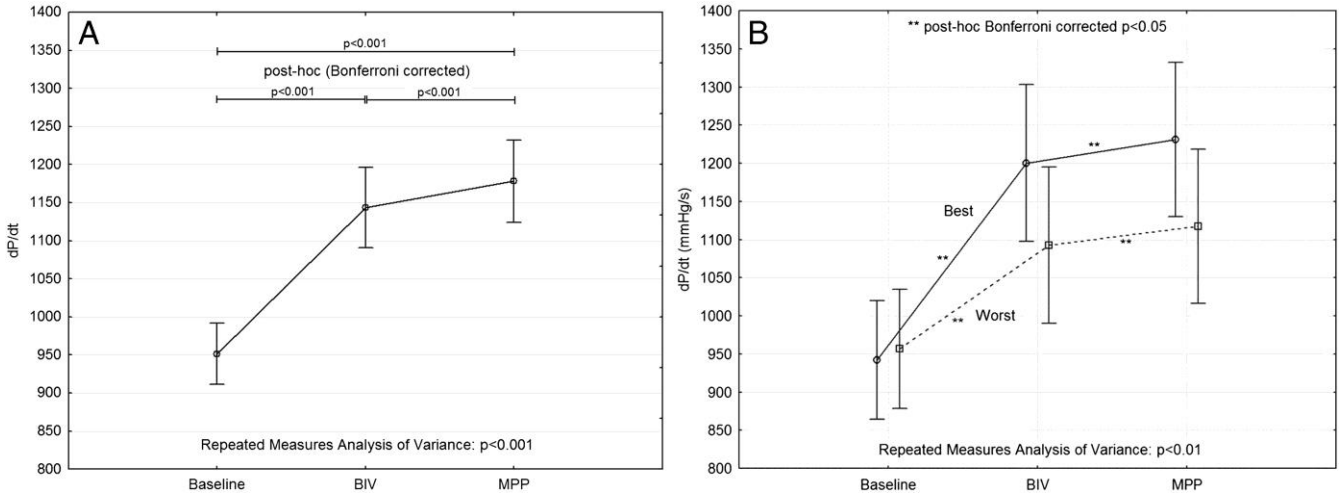
EPI-CRT and ENDO-CRT compared with AAI



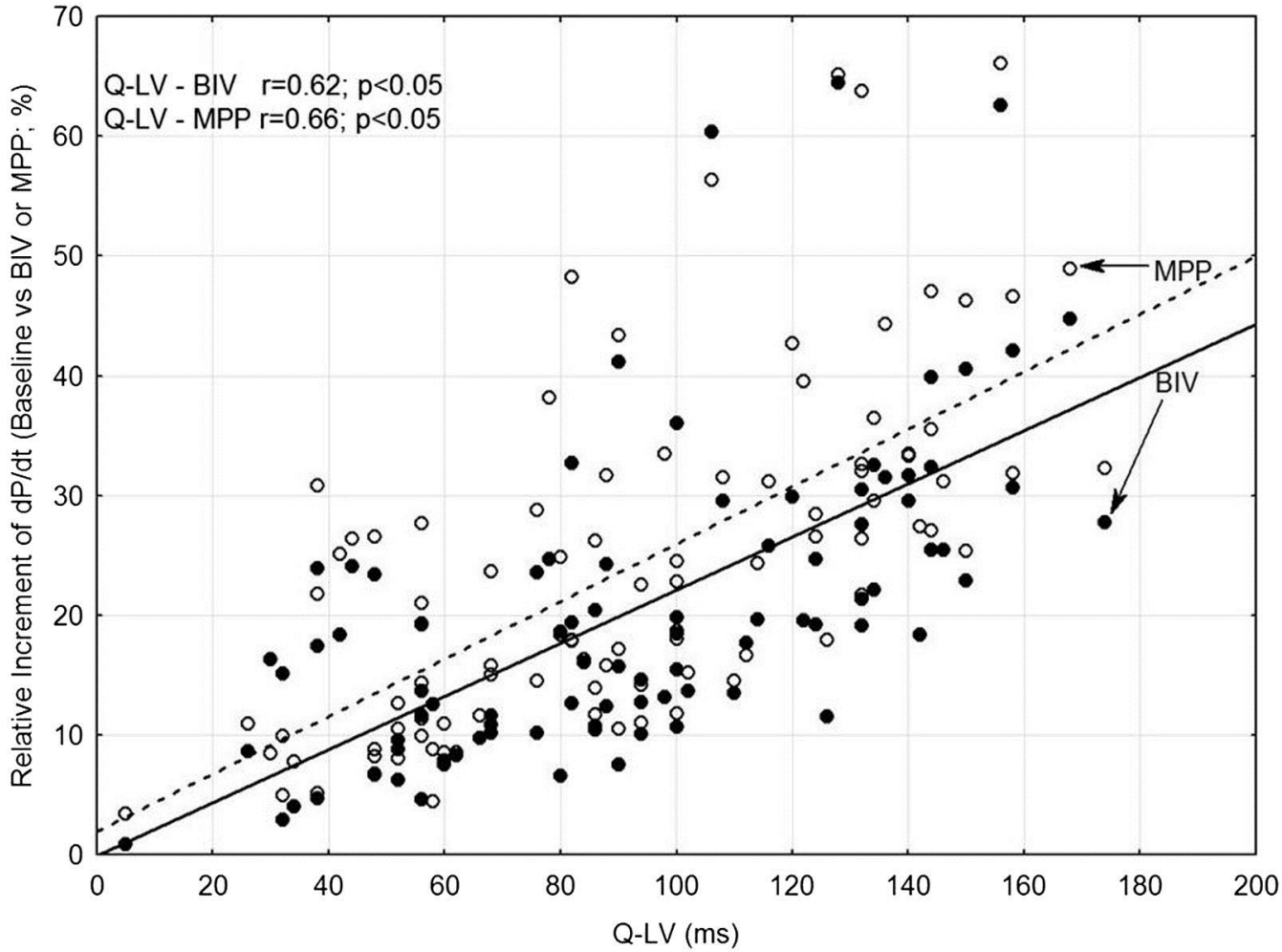
Strik M, et al. Circ Arrhythm Electrophysiol. 2012;5:191-200

Figure 3a


p = NS
p<0.001
p<0.001
40
20
0
-20
-40
Δ LV dP/dt$_{max}$ (%)
p<0.001
p<0.001
p = NS
MPP
Base
Mid
Apex



Heart Rhythm 2015 12, 975-981DOI: (10.1016/j.hrthm.2015.01.034)



Zanon F, et al. Heart Rhythm 2015 12, 975-981DOI: (10.1016/j.hrthm