What's Old is New Again

HIS Bundle Pacing

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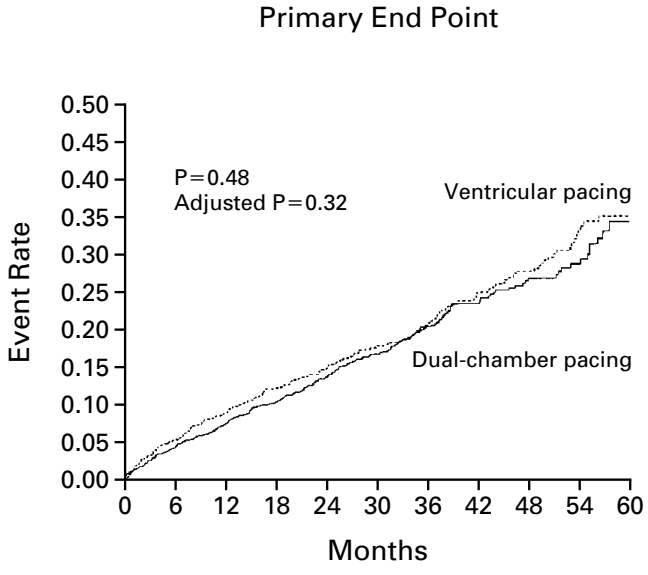
Objectives

- Define limitations of non-physiologic pacing
- Describe HIS bundle anatomy
- Describe feasibility of HIS bundle pacing

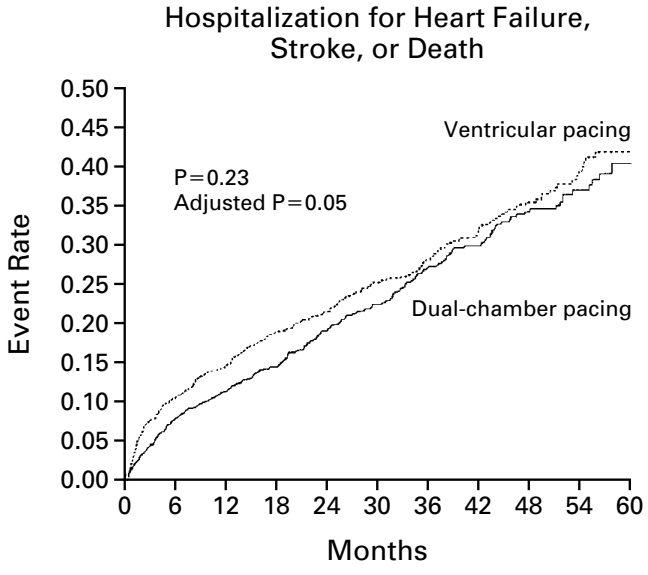
Is the cure worse than the disease?

- At its core pacing is intended to support the ventricular rate.
- Traditional dual chamber pacemakers have significant drawbacks regardless of the pacing indication.
  - Sinus node disease
  - Complete heart block

Pacing Mode Does Not Alter Outcome



No. at Risk											
Ventricular pacing	996	934	897	813	678	557	431	320	218	125	39
Dual-chamber pacing	1014	963	930	833	693	555	431	328	214	120	28



No. at Risk											
Ventricular pacing	996	880	839	752	624	504	388	287	193	110	35
Dual-chamber pacing	1014	926	889	793	649	518	394	297	188	105	26

There is no such thing as low burden pacing.

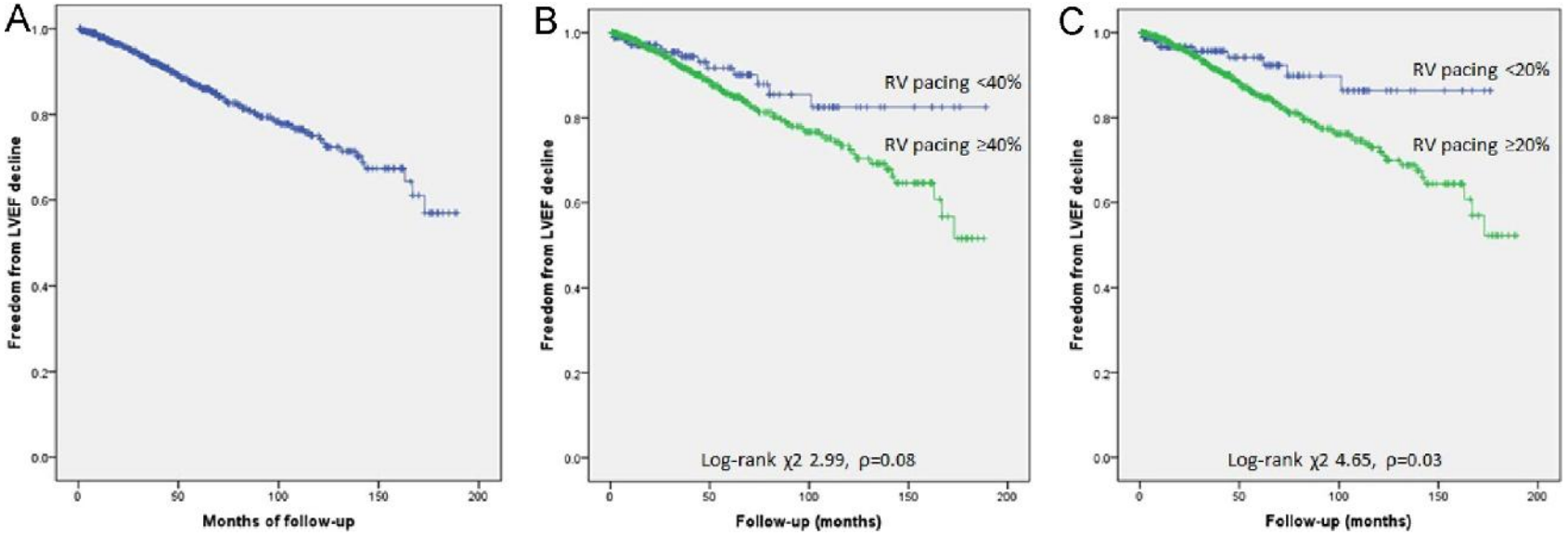


Figure 2 Kaplan-Meier curves depicting 15-year survival without LVEF decrease to ≤40% (PICM) for (**A**) the entire cohort, (**B**) cohort stratified by <40% or ≥40% RV pacing, and (**C**) cohort stratified by <20% or ≥20% RV pacing. LVEF = ejection fraction; PICM = pacing-induced cardiomyopathy; RV = right ventricular.

(Heart Rhythm 2016;13:2272–2278)

Incidence and predictors of right ventricular pacing-induced cardiomyopathy

Shaan Khurshid, MD,* Andrew E. Epstein, MD, FHRS,* Ralph J. Verdino, MD,* David Lin, MD, FHRS,* Lee R. Goldberg, MD,*† Francis E. Marchlinski, MD, FHRS,* David S. Frankel, MD, FHRS*

- 19.5% of patients with dual chamber pacemakers implanted developed a pacing mediated myopathy.
- Mean reduction in EF 62% to 36%
- Baseline QRS duration of >115 ms was 90% specific for the development of pacing mediated myopathy.
- Pacing % does not predict change in LVEF.

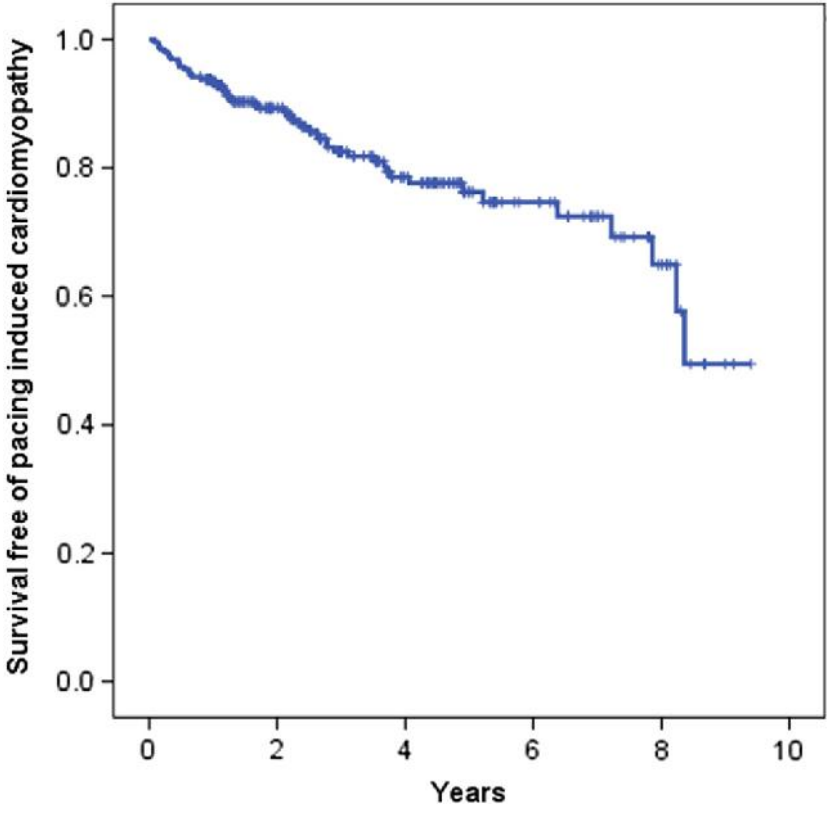


Figure 3 Survival free of pacing-induced cardiomyopathy. Kaplan-Meier curve is shown for 10-year survival free of right ventricular pacing-induced cardiomyopathy.

(Heart Rhythm 2014;11:1619–1625)

RV Apical v. RV Septal Positioning

Protect Pace Study

- Normal EF patient with >50%
- RV apical versus RV septal
- No difference in EF, Heart failure hospitalization, AF, or 6 minute walk.
- Longer implant and flouro times for RV septal lead placement.
- 1/3 of RV septal leads were actually not septal

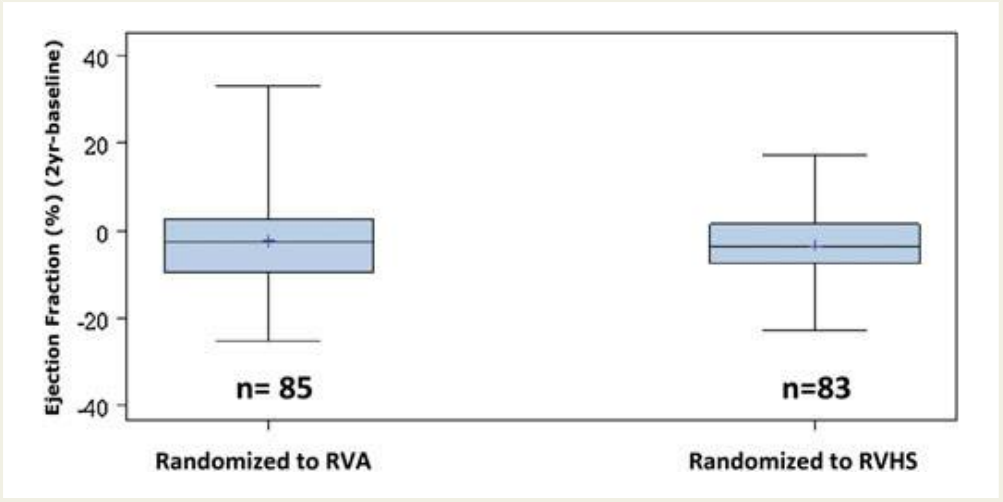
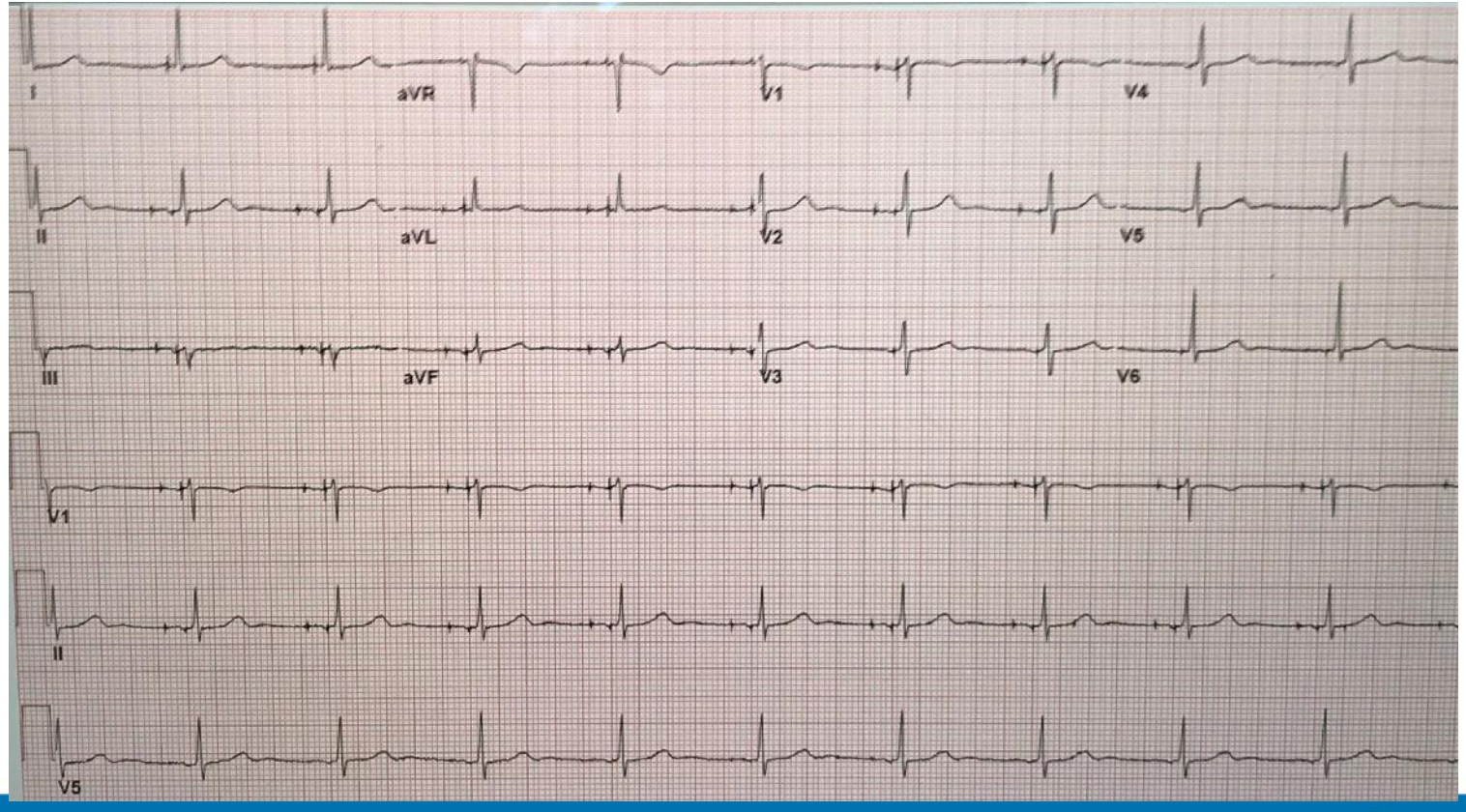


Figure 2 Change in LV ejection fraction by randomization assignment.

Kaye et al., European Heart Journal 2015: 36, 856–862

Don’t be fooled – we are pacing!



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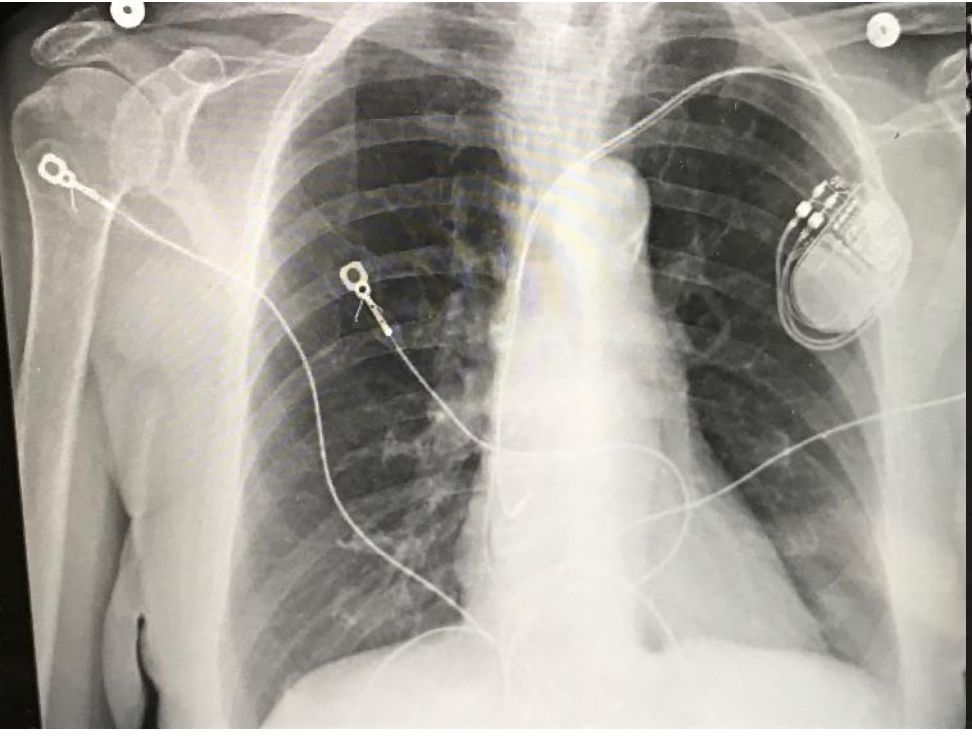
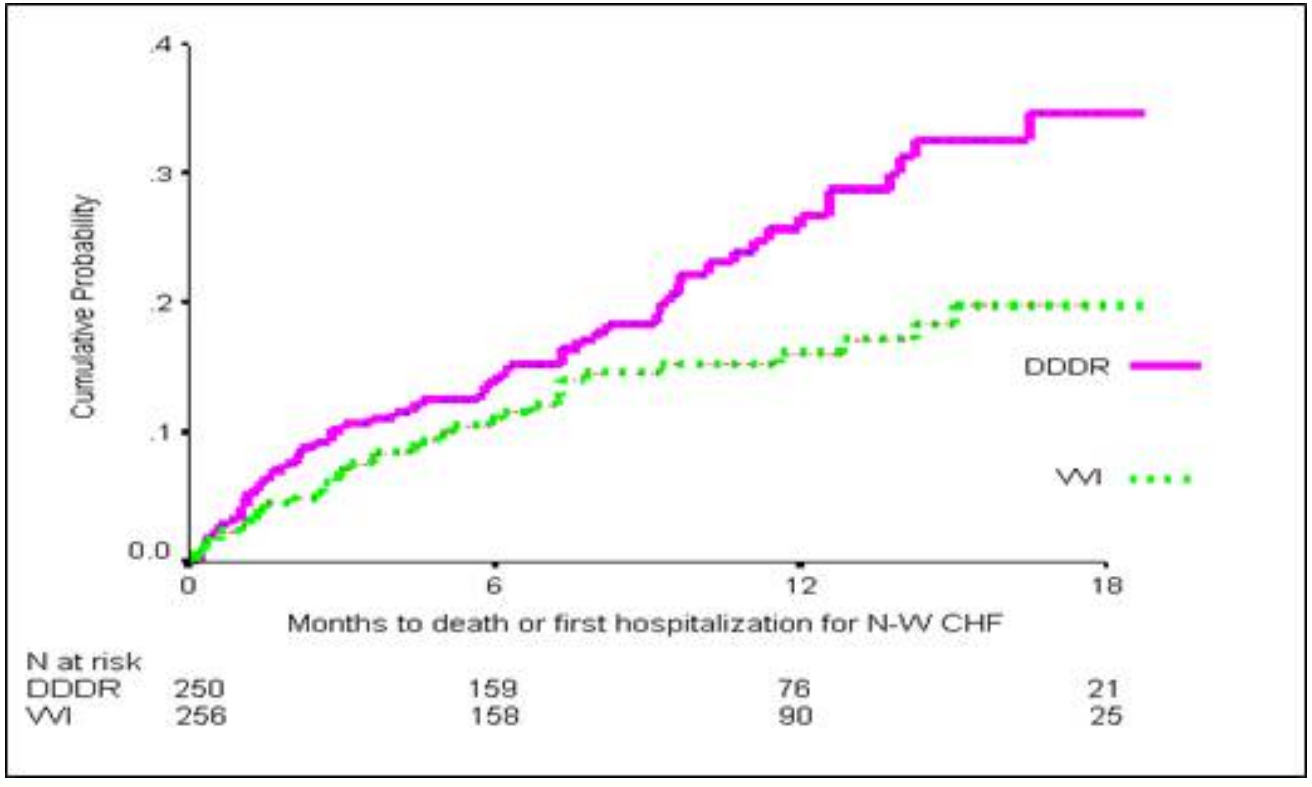
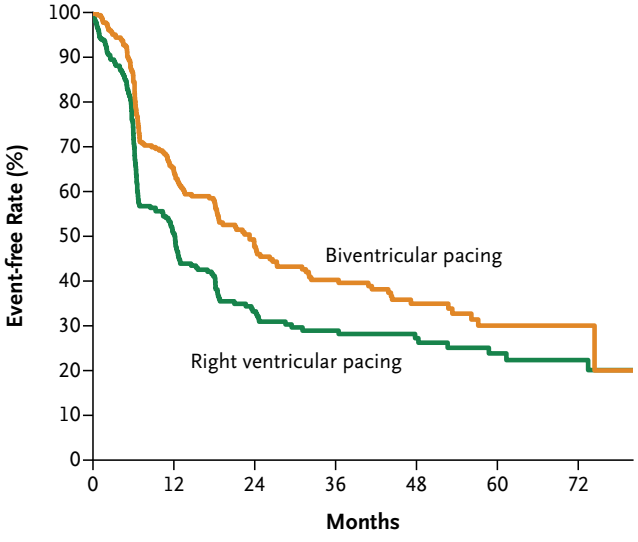


Poor Outcomes in HF Patients



Wilkoff et al., AMA 2002; 288(24):3115-3123

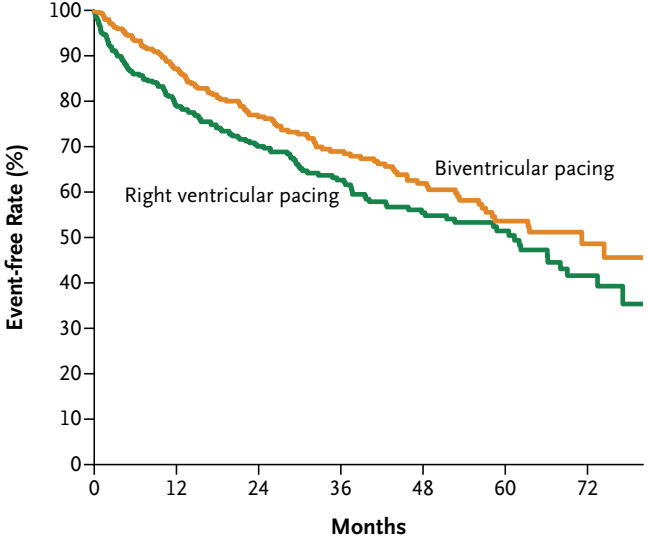
That's why we have CRT, right?



No. at Risk

Biventricular pacing	349	161	87	62	38	17	3
Right ventricular pacing	342	126	59	39	28	18	10

Figure 2. Freedom from a Primary-Outcome Event.



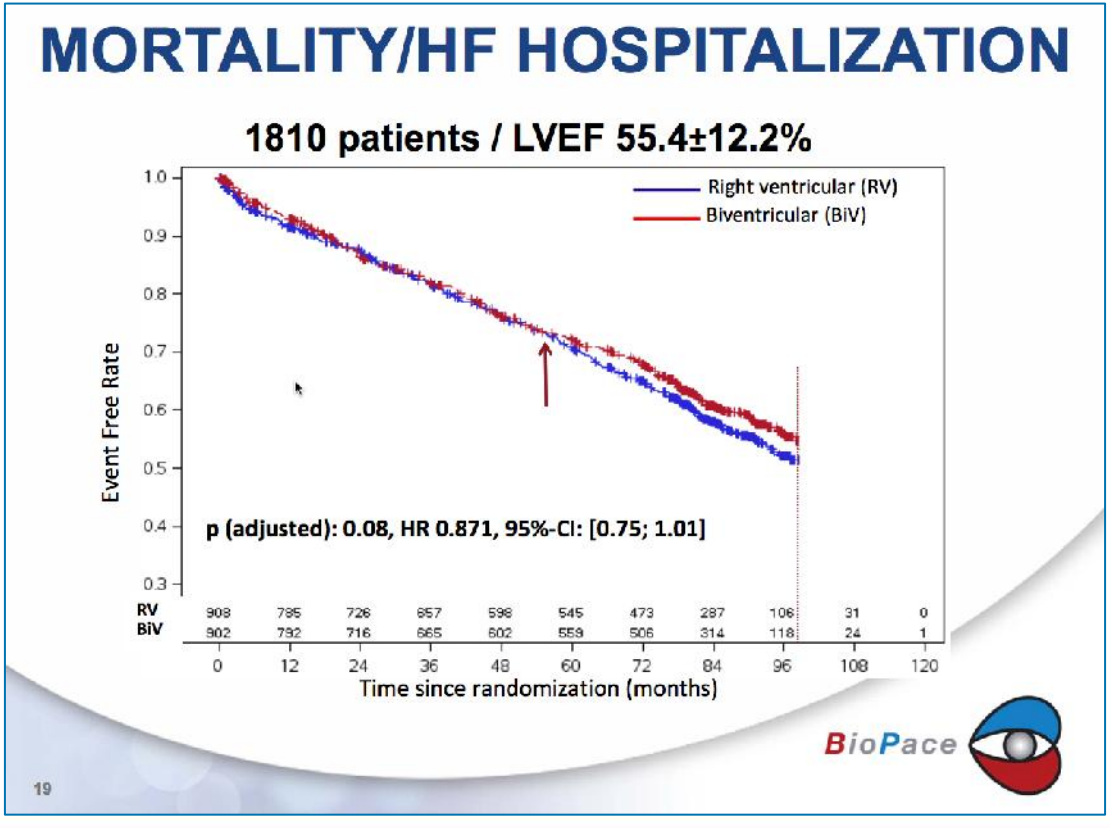
No. at Risk

Biventricular pacing	349	271	195	134	91	52	17
Right ventricular pacing	342	248	180	121	88	54	22

Figure 3. Freedom from the Clinical Components of the Primary Outcome.

AB Curtis et al., N Engl J Med 2013; 368:1585-1593

Maybe – Biopace Trial



Just the facts

Pacing mode does not mitigate against the detrimental effects of pacing.

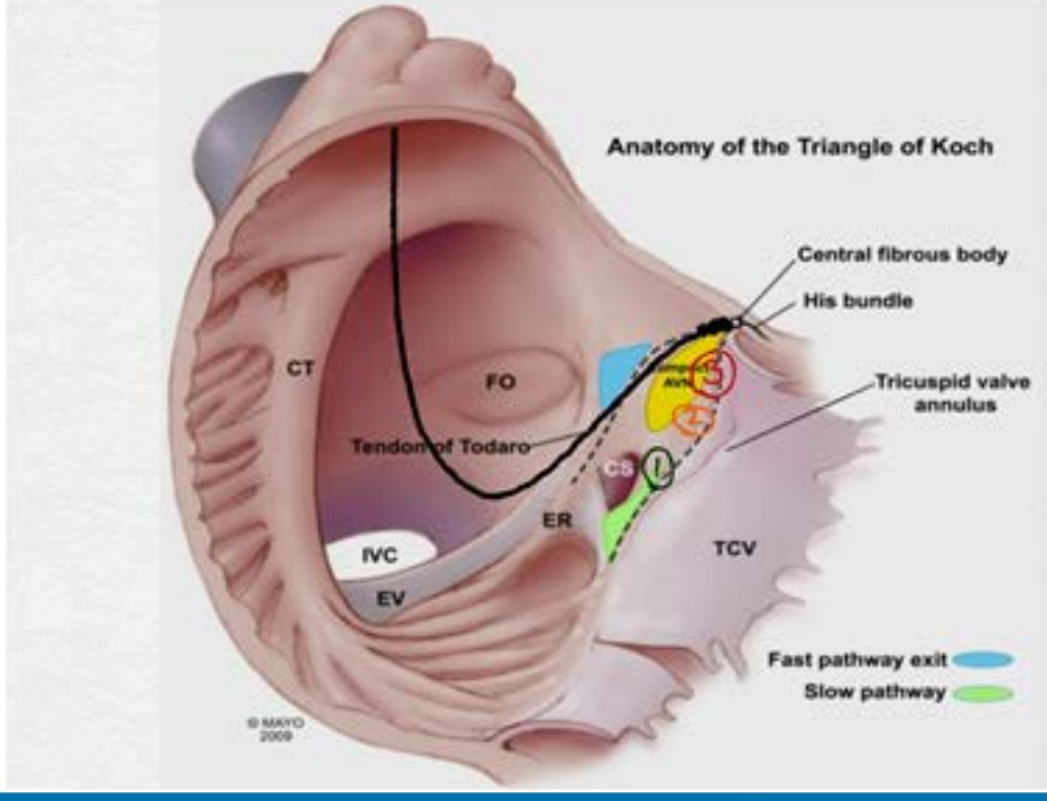
RV apical and septal pacing are equal in their poor outcomes

Only patients with advanced HF and wide LBBB (>150 ms) clearly benefit from CRT

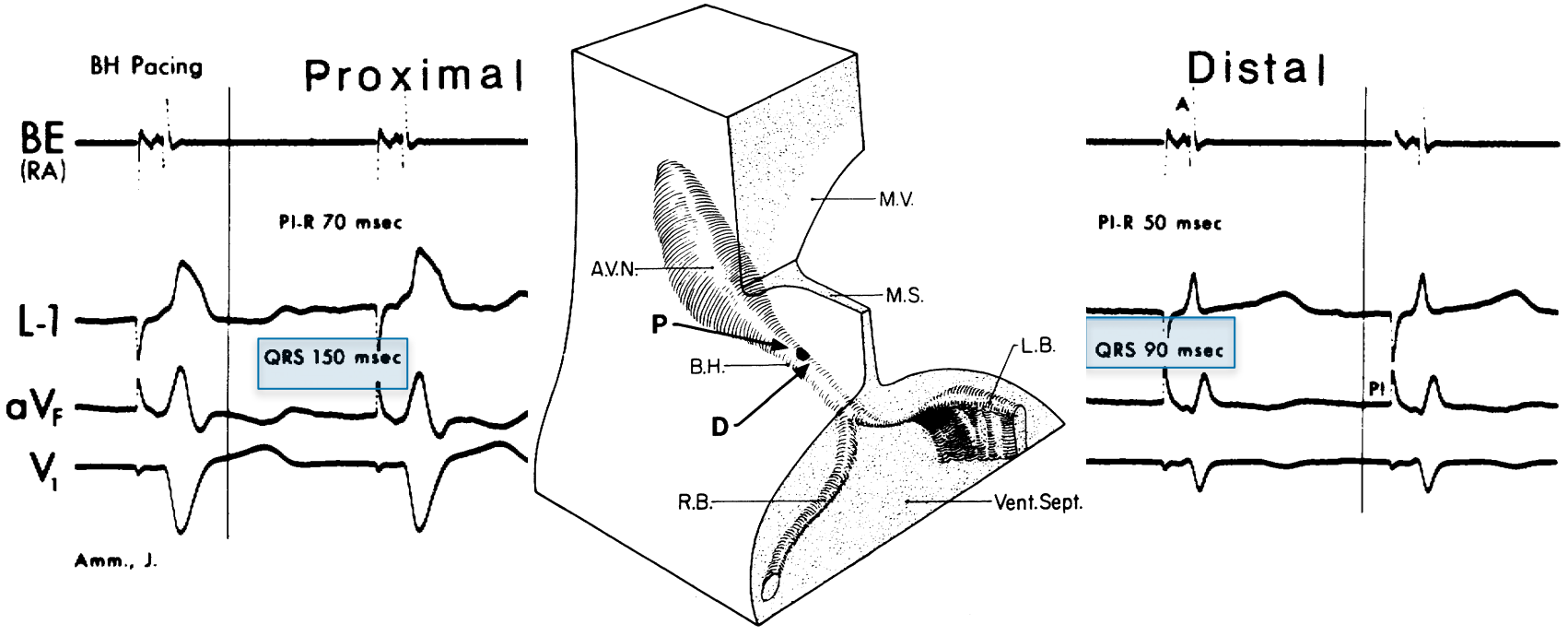
- 2013 ACC/AHA/HRS guidelines (sinus, EF <35%, GDMT)
- Strong recommendation & strong evidence
  - **NYHA class III/IV, LBBB>150 ms (weaker evidence for class II)**
- NYHA class III/IV, non-LBBB>150 ms (weak recommendation)
- NYHA class II/III/IV, LBBB 120-149 ms (weak recommendation with weak evidence)

A Revolution In Pacing?

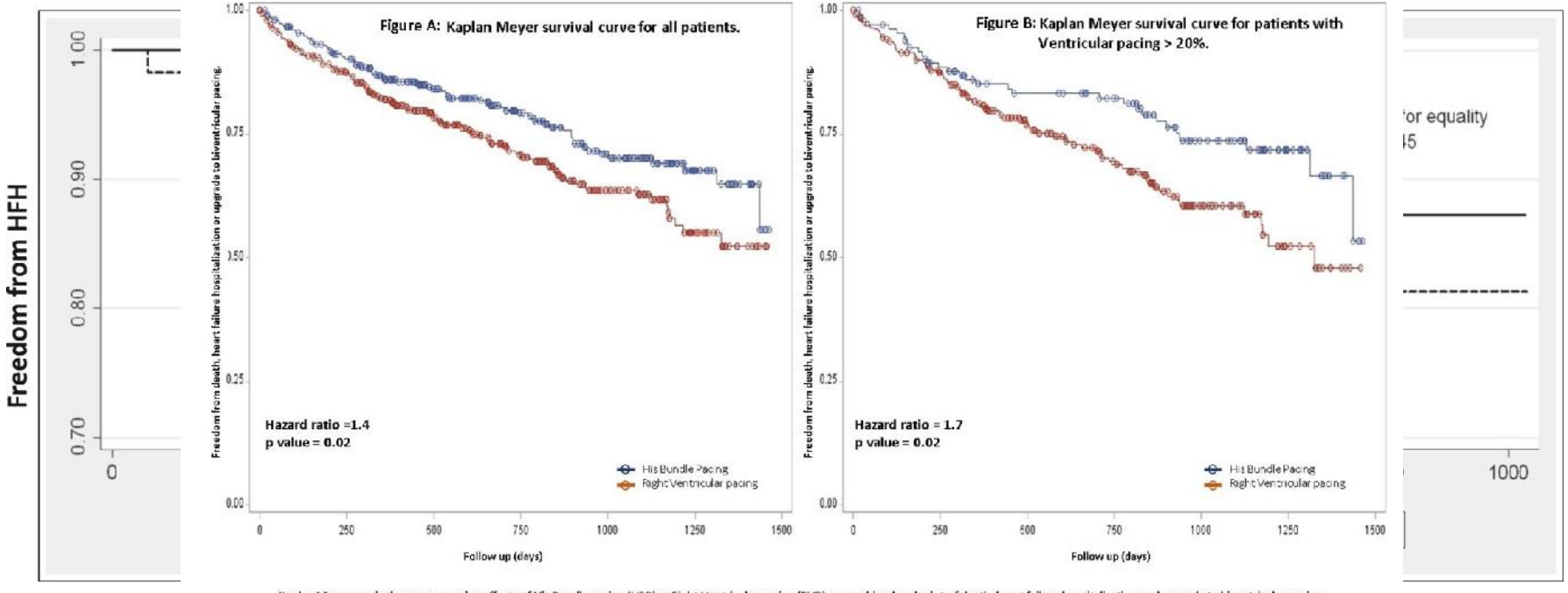
- Replicates true human physiology
- Lead tip & body potentially within the right atrium
  - Could prevent lead related issues such as tricuspid regurgitation
- Ideal form of AV and VV (intraventricular and interventricular)
- Data not convincing for other forms of pacing
  - RV pacing and its detrimental effects
  - BiV pacing equivocal in EF > 35% (BLOCK-HF/BIOPACE)



HIS Bundle Pacing Physiology



HIS Bundle v. RV Pacing

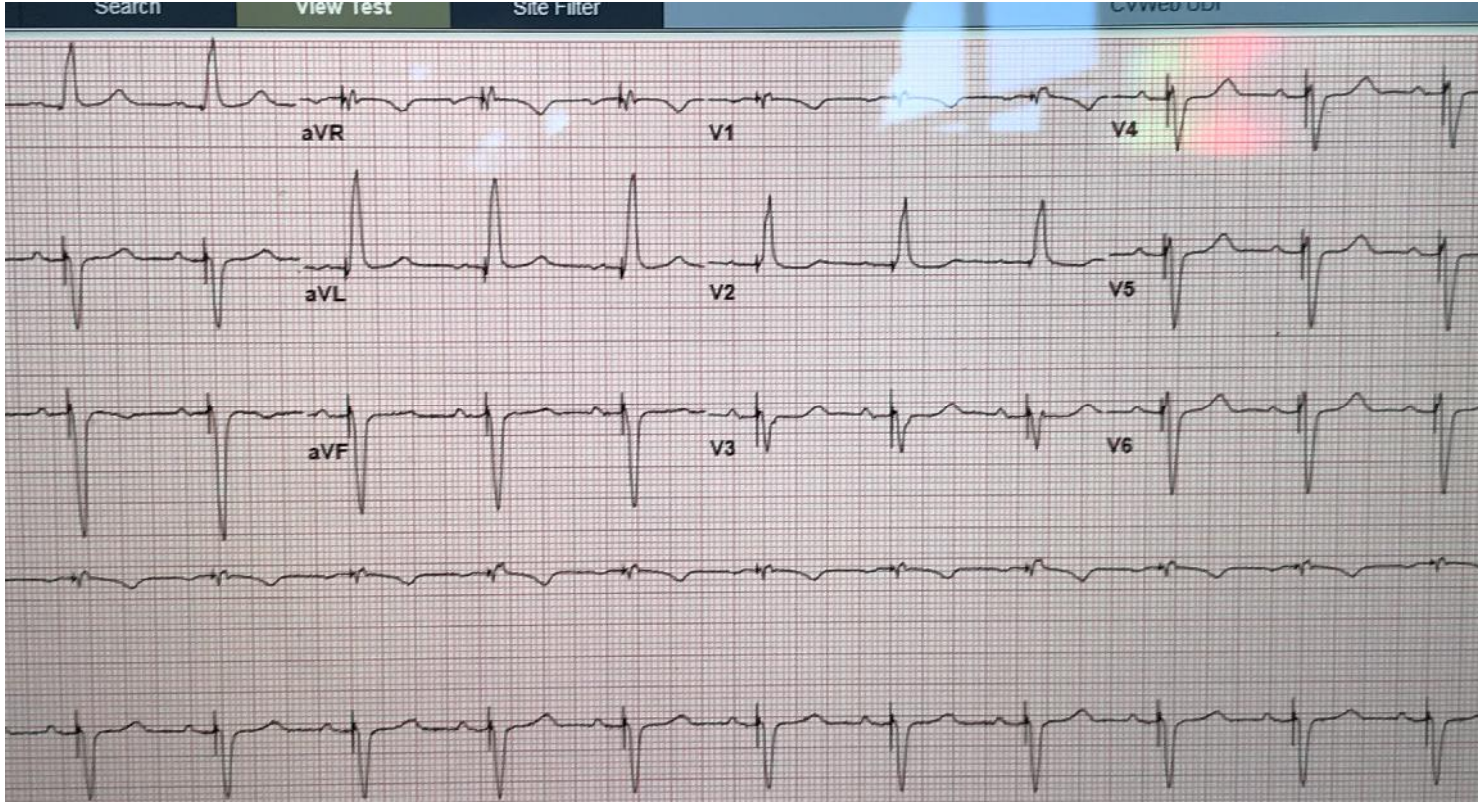


Kaplan Meyer survival curve comparing effects of His Bundle pacing (HBP) vs Right Ventricular pacing (RVP) on combined endpoint of death, heart failure hospitalization and upgrade to biventricular pacing. (A; comparing all patients of HBP vs RVP. B; comparing patients with ventricular pacing >20% in HBP vs RVP.)

(http://files.abstractsonline.com/CTRL/5f/6/c2a/6e3/2b2/454/197/3db/251/89b/ff3/da/g18946_1.

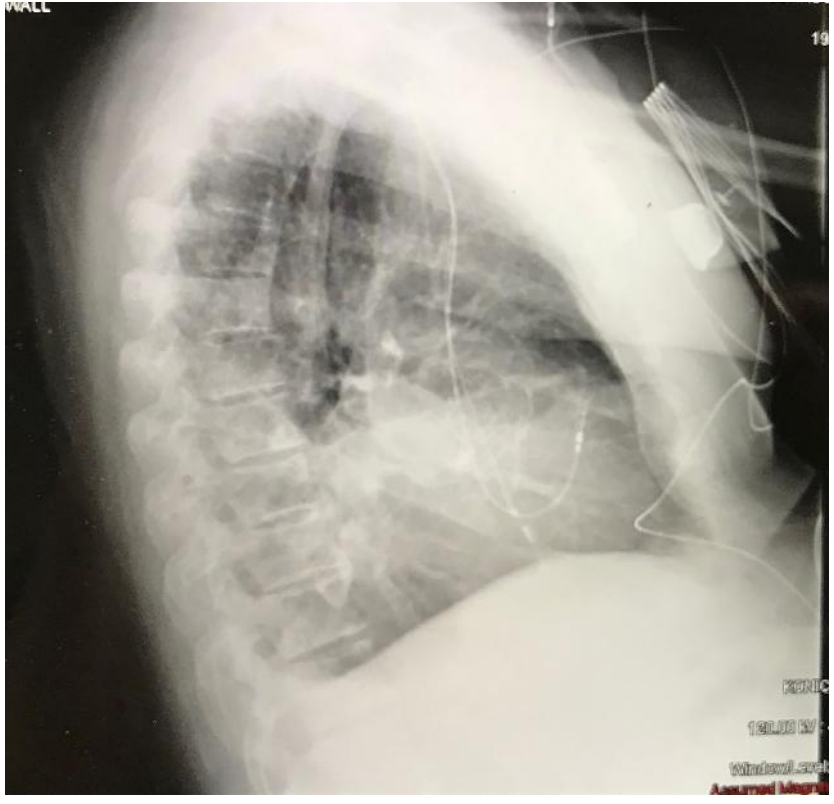
Heart Rhythm 2015 12, 305-312DOI: (10.1016/j.hrthm.2014.10.021)

Post - TAVR

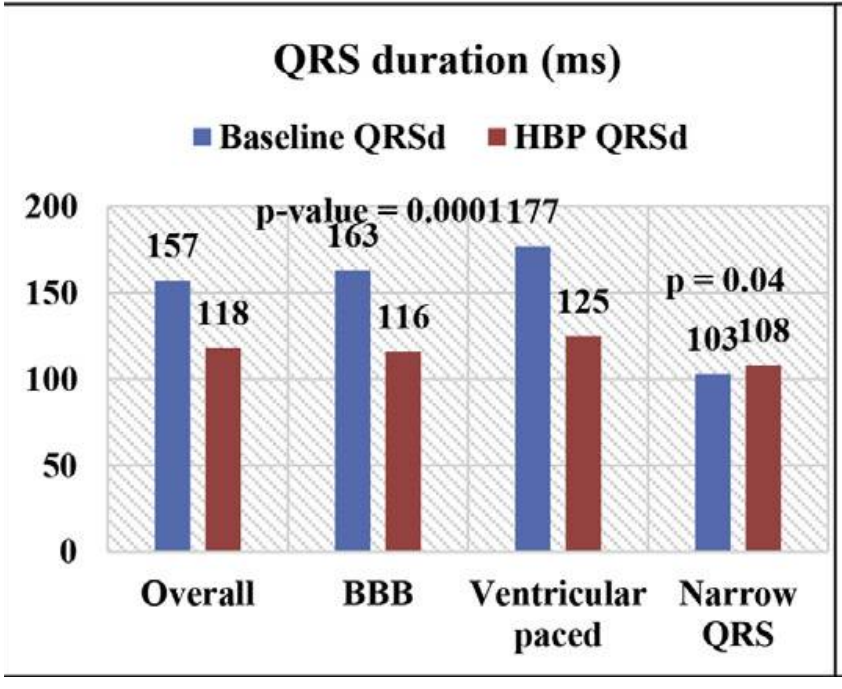


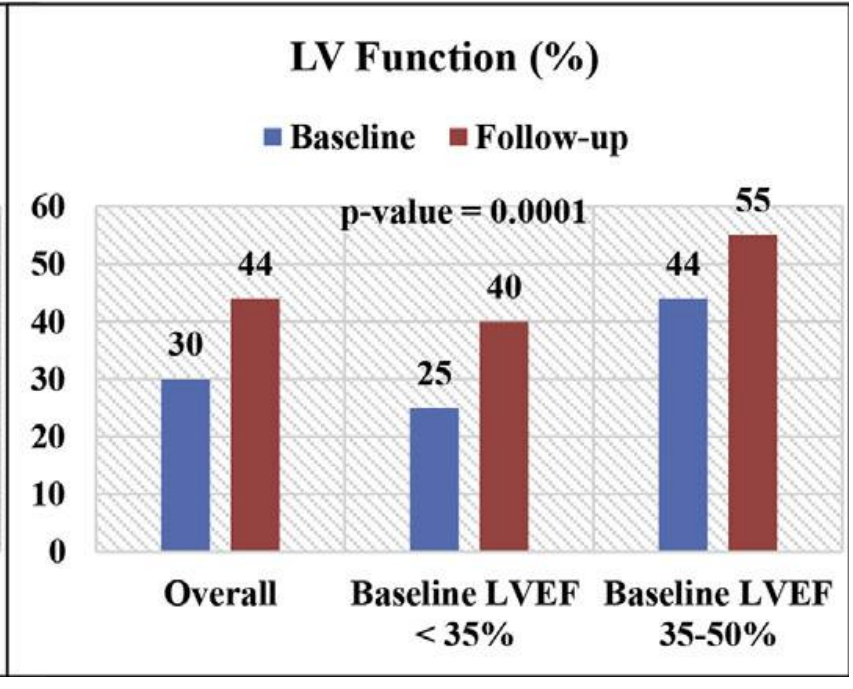
RBBB – CHB following TAVR

Post - TAVR



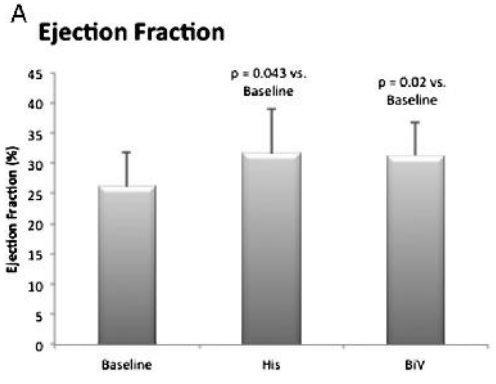
HIS Bundle v. CRT Pacing

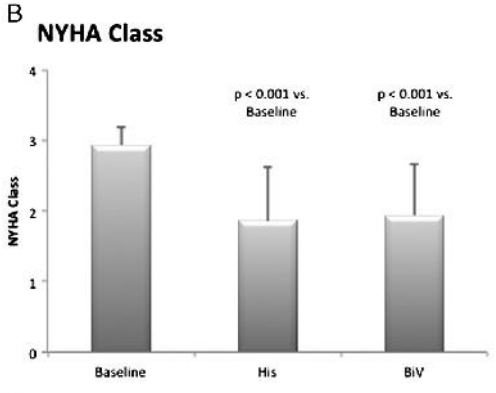


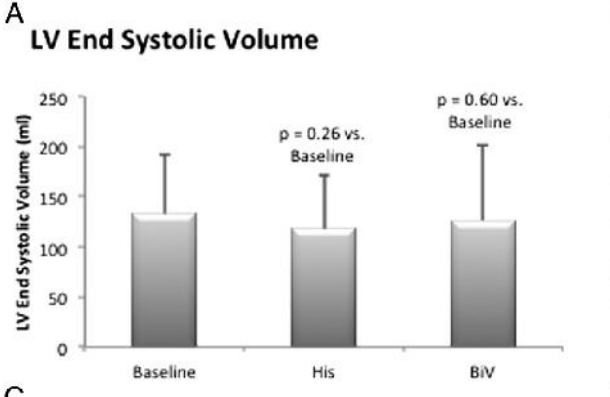


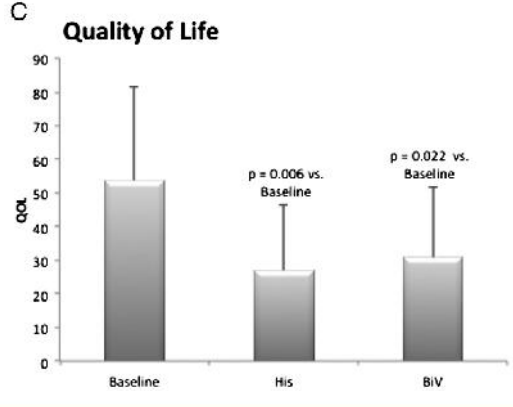
(Heart Rhythm 2018;15:413–420)

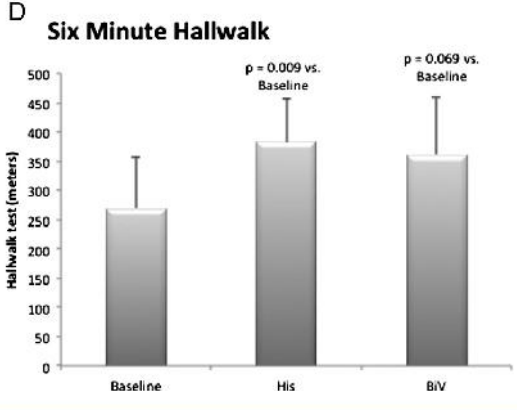
HIS Bundle v. CRT Pacing (Crossover)

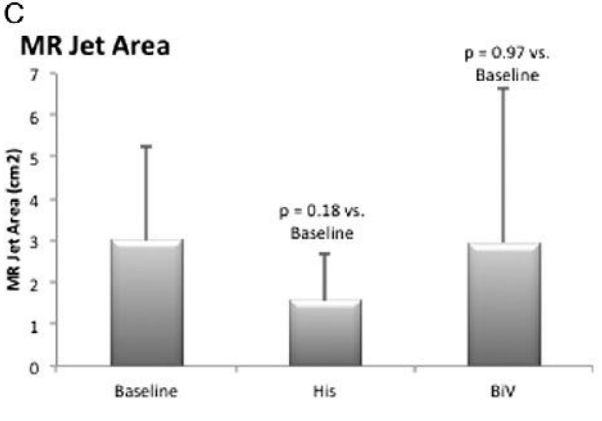












(Heart Rhythm 2015;12:1548–1557)

Long term follow-up

- Patients need to be approached much more like CRT patients.
  - Lead thresholds set to HIS capture not lowest threshold.
  - Short AV delays (Paced AV delay 140/Sensed AV delay 120)

Questions?